

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

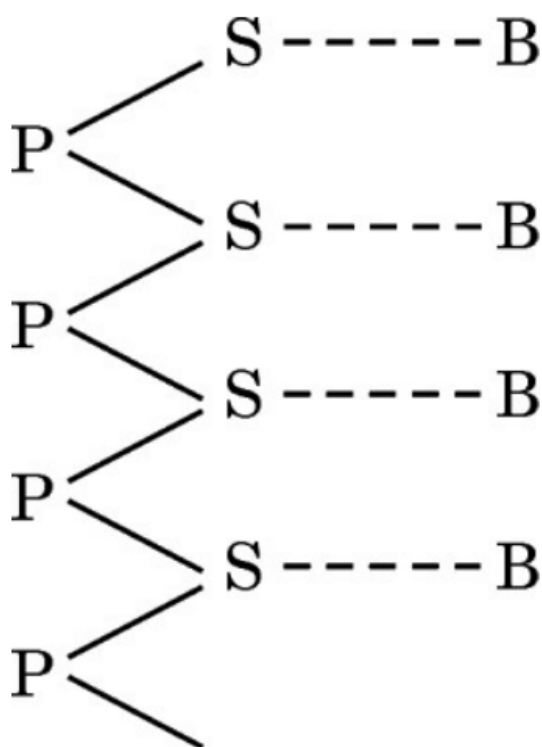
Maximum Marks: 70

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 type of bond represented by the dotted line '-----' in a schematic polynucleotide chain is:



- | | |
|--------------------------|-------------------------|
| (A) Hydrogen bond | (B) Peptide bond |
| (C) N-glycosidic linkage | (D) Phosphodiester bond |

2. 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) i-iii-v-iv-ii | (B) i-iv-v-ii-iii |
| (C) iv-i-v-iii-ii | (D) v-ii-iii-iv-i |

3. Lactobacillus that sets milk into curd is categorised as:

- | | |
|-----------------------------|----------------------------|
| (A) Cyanobacteria | (B) Archaeobacteria |
| (C) Chemosynthetic bacteria | (D) Heterotrophic bacteria |

4. 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 |

5. 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 |

6. 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 |

7. 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 |

8. 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 |

9. 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 |

10. 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 |
| (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 |

11. 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 |

12. 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) |

13. 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. |
-

14. 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. |
-

15. 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. |
-

16. 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. |
-

Section B

17. Do you think apomixis can be compared to asexual reproduction? Justify your answer. State the benefits of apomixis to the farmers.

18(a)(i). 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.

What did the doctor inject and why?

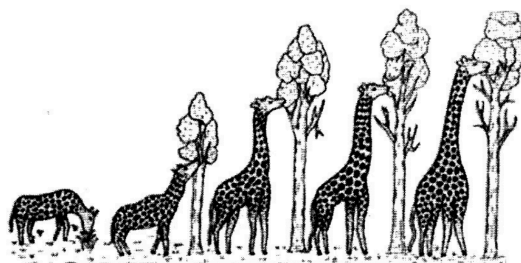
18(a)(ii). A farmer while working on his farm was bitten by a poisonous snake. He was rushed to a nearby health centre where the doctor gave him an injection to save his life.

Name the kind of immunity provided by this injection.

OR

18(b). Why do organic farmers not recommend complete eradication of insect pests? Explain giving reason.

19. Observe the picture given below. Name the naturalist and write the explanation given by him that evolution of life forms had occurred on the basis of this example.



20. 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?

21(a). A specific plant species was introduced into Australia in 1920 and later it became invasive spreading over millions of hectares of rangeland.

Name the plant that was introduced into Australia and mention the reason for its uncontrollable growth.

21(b). A specific plant species was introduced into Australia in 1920 and later it became invasive spreading over millions of hectares of rangeland.

State how its spread was eventually brought under control.

Section C

22(a)(i). What are transgenic animals?

22(a)(ii). Name the first transgenic cow and state its importance.

OR

22(b)(i). Explain the convention for naming EcoRI.

OR

22(b)(ii). With the help of an illustration only, show the action of EcoRI on a DNA Polynucleotide.

23. Identify A, B, C, D, E and F in the table given below:

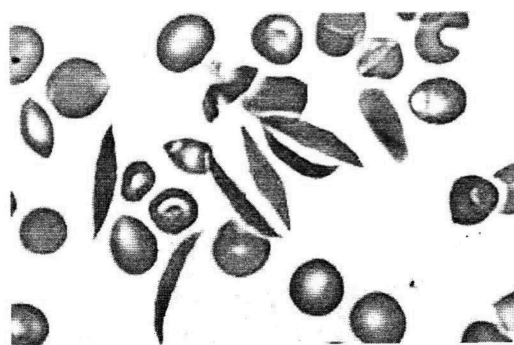
Name of Human Disease	Causative Organism	Symptoms
Pneumonia	- Streptococcus	- 'A'
Typhoid	- 'B'	- High fever, weakness, headache, stomach pain
Common Cold	- Rhino virus	- 'C'
Ringworm	- 'D'	- Dry scaly lesions on body parts, redness, itching
Ascariasis	- Ascaris	- 'E'
'F'	- Entamoeba histolytica	- Constipation, cramps, stools with mucous and blood clots

24. Explain the mode of action of contraceptive pills taken by human females. Mention the schedule to be followed for effective outcome.

25(a). Name and write two characteristics of the type of DNA that forms the basis of DNA fingerprinting technique.

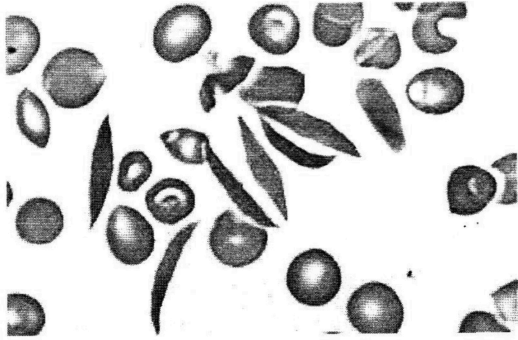
25(b). Mention any two applications of this technique.

26(a). Given below is a picture that shows the magnified blood smear of a patient under a microscope.



Name the disease the blood smear is indicative of. Write the symptoms of the disease and its cause.

26(b). Given below is a picture that shows the magnified blood smear of a patient under a microscope.



Explain the inheritance pattern of the disease with the help of a suitable cross.

27(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.

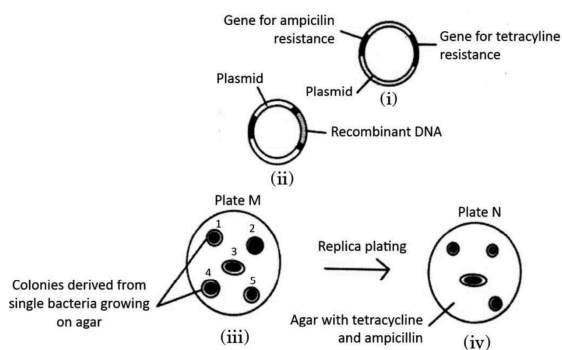
27(b). How does meteorite analysis favour this hypothesis?

28(a). State what is primary productivity and mention its units.

28(b). Some ecologists observed that primary productivity of a place in Rajasthan was low as compared to a particular place in Kerala. Explain why.

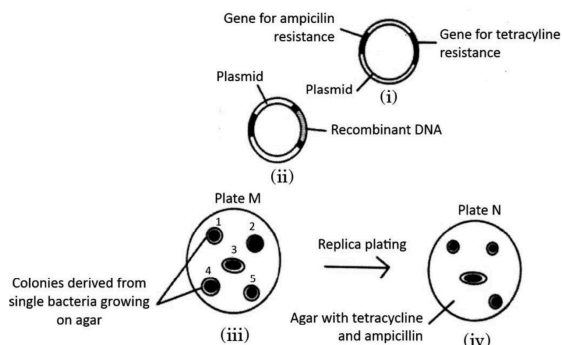
Section D

29(a). Study the diagram given below that shows the steps involved in the procedure of selecting transformed bacteria and answer the questions that follow:



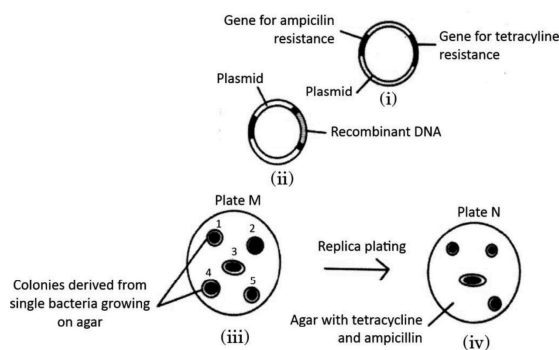
Identify the colony that has got transformed. Justify your answer.

29(b). Study the diagram given below that shows the steps involved in the procedure of selecting transformed bacteria and answer the questions that follow:



What are the sites in a plasmid called where ampicillin and tetracycline resistance genes are inserted? State their role in genetic engineering.

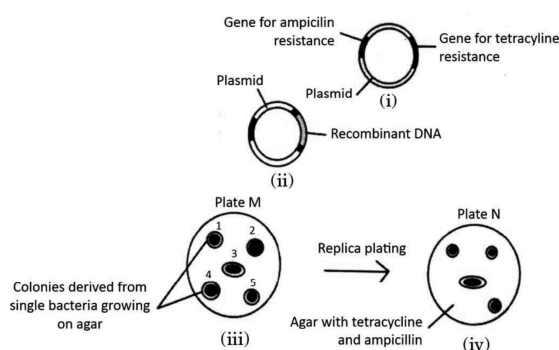
29(c). Study the diagram given below that shows the steps involved in the procedure of selecting transformed bacteria and answer the questions that follow:



Name two enzymes playing an important role in genetic engineering.

OR

29(c). Study the diagram given below that shows the steps involved in the procedure of selecting transformed bacteria and answer the questions that follow:

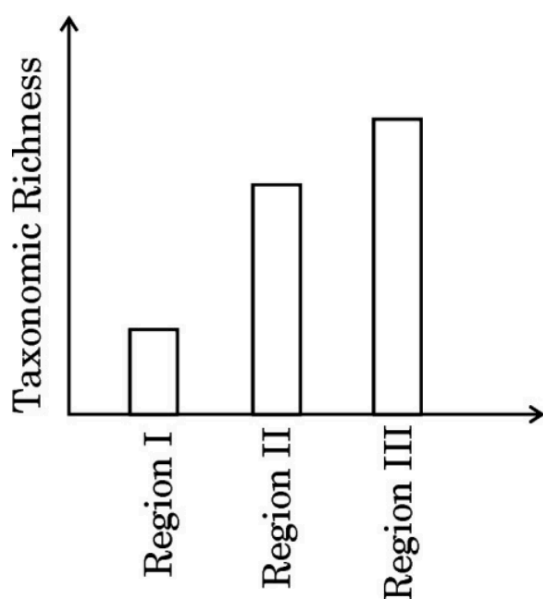


State the role of beta-galactosidase in insertional inactivation.

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

Isn't it incredible that India's land area is only 2.4 per cent of the world's total land area whereas its share of the global species diversity is an impressive 8.1 per cent! However, in these estimates of species, prokaryotes do not figure anywhere.

Biologists are always keen on collecting data with respect to species diversity observed in different regions of the world. The data collected based on the survey conducted for species richness of groups of mammals in three different regions of the world is shown in the bar graph given below:



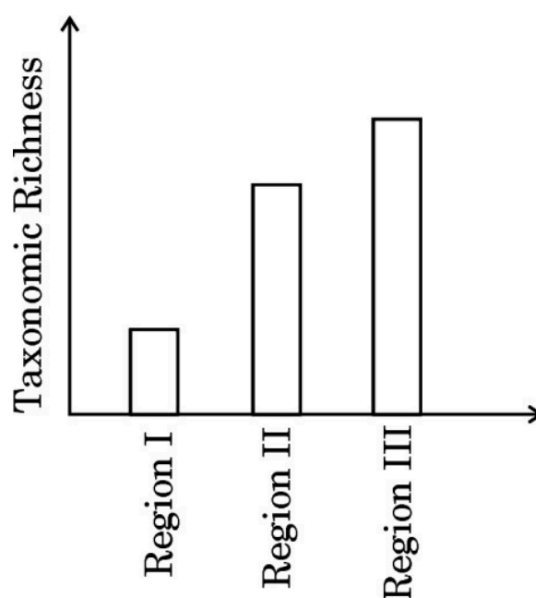
Why is the species richness maximum in Region III in the bar graph?

OR

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

Isn't it incredible that India's land area is only 2.4 per cent of the world's total land area whereas its share of the global species diversity is an impressive 8.1 per cent! However, in these estimates of species, prokaryotes do not figure anywhere.

Biologists are always keen on collecting data with respect to species diversity observed in different regions of the world. The data collected based on the survey conducted for species richness of groups of mammals in three different regions of the world is shown in the bar graph given below:

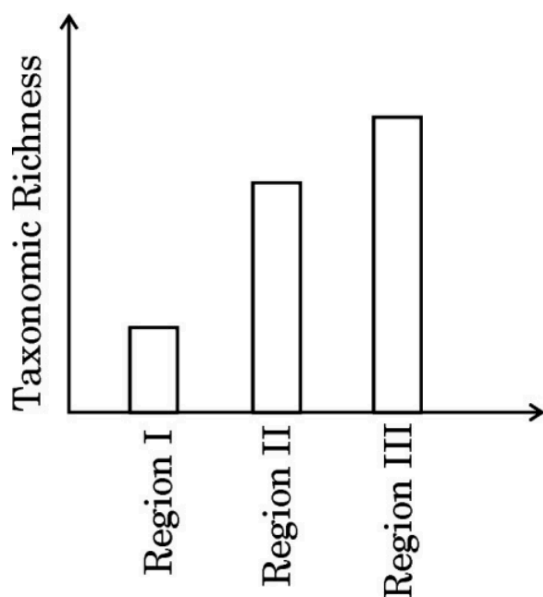


Why is the species richness minimum in Region I in the bar graph?

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

Isn't it incredible that India's land area is only 2.4 per cent of the world's total land area whereas its share of the global species diversity is an impressive 8.1 per cent! However, in these estimates of species, prokaryotes do not figure anywhere.

Biologists are always keen on collecting data with respect to species diversity observed in different regions of the world. The data collected based on the survey conducted for species richness of groups of mammals in three different regions of the world is shown in the bar graph given below:

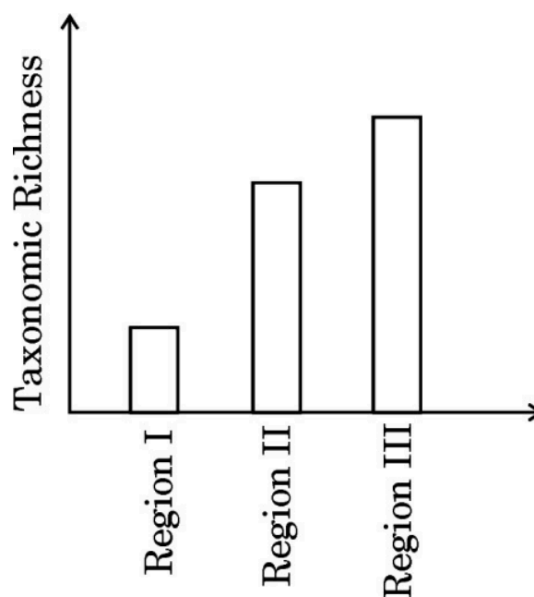


Plants and animals do not have uniform diversity in the world but show rather uneven distribution. Mention what this kind of diversity is referred to as.

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

Isn't it incredible that India's land area is only 2.4 per cent of the world's total land area whereas its share of the global species diversity is an impressive 8.1 per cent! However, in these estimates of species, prokaryotes do not figure anywhere.

Biologists are always keen on collecting data with respect to species diversity observed in different regions of the world. The data collected based on the survey conducted for species richness of groups of mammals in three different regions of the world is shown in the bar graph given below:



Why is it that prokaryotes do not have an estimated number of their species diversity as seen in plants and animals? Explain.

Section E

31(a)(i). Name and explain the property present in normal cells but is lost in cancer cells.

31(a)(ii). All normal human cells have genes that may become cancerous under certain conditions. Name them and explain how.

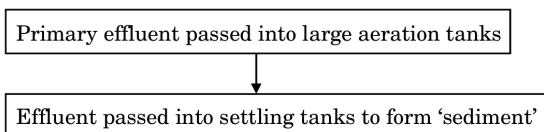
31(a)(iii). State the role of the following techniques in detection and diagnosis of cancer:

- (1) Biopsy and Histopathology
- (2) Magnetic Resonance Imaging

OR

31(b)(i). Large quantities of sewage are generated every day in cities as well as in towns and are treated in Sewage Treatment Plants (STPs) to make them less polluting. Given below is the flow diagram of stages of STP.

Study the flow diagram and answer the questions that follow:

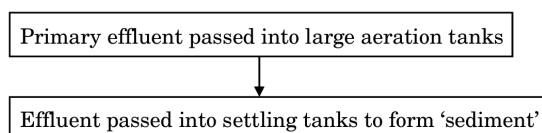


- (1) Why is primary effluent passed into large aeration tanks?
- (2) What is the 'sediment' formed, referred to as? Mention its significance.
- (3) Explain the final step in the settling tank before the treated effluent is released into water bodies.

OR

31(b)(ii). Large quantities of sewage are generated every day in cities as well as in towns and are treated in Sewage Treatment Plants (STPs) to make them less polluting. Given below is the flow diagram of stages of STP.

Study the flow diagram and answer the questions that follow:

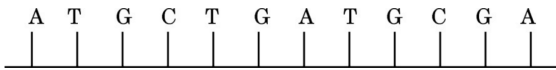


Name any two organisms commonly used as biofertilisers, belonging to different kingdoms. Write how each one acts as a biofertiliser.

32(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.

OR

32(b)(i). Construct a transcription unit with a coding strand given below with proper labelling:



OR

32(b)(ii). When does a coding strand become a template strand?

OR

32(b)(iii). Why does a double-helix DNA molecule transcribe into a single-stranded RNA molecule?

33(a)(i). Explain the development of male gametophyte in an angiosperm.

33(a)(ii). Draw a labelled diagram of a three-celled male gametophyte.

OR

33(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

OR

33(b)(ii). At which stage of life are primary follicles formed in a human female?

OR

33(b)(iii). Explain the events (both hormonal and structural) that occur at the time of ovulation till the onset of the next menstrual cycle.

- End of Question Paper -