

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

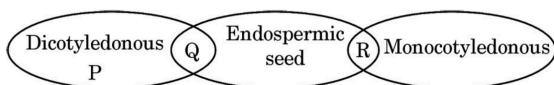
Maximum Marks: 70

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.

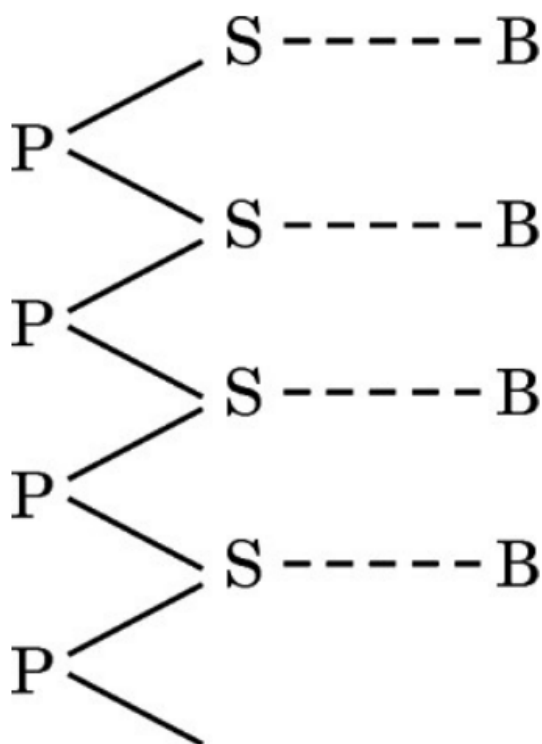
Section A

1. Refer to the Venn diagram given below. Select the option with correct examples P, Q, and R:



- | | |
|--------------------------------|--------------------------------------|
| (A) P-Castor, Q-Onion, R-Wheat | (B) P-Bean, Q-Castor, R-Maize |
| (C) P-Pea, Q-Gram, R-Barley | (D) P-Coconut, Q-Rubber, R-Groundnut |

2. 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 |

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

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

4. 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 |

5. 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' is:

- | | |
|-------------------|-------------|
| (A) Darwin | (B) Lamarck |
| (C) Ernst Haeckel | (D) Mendel |

6. 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 |

7. During an allergic reaction, the binding of antigen to IgE antibodies initiates release of:

- | | |
|----------------|-----------------|
| (A) Interferon | (B) Histamine |
| (C) Heparin | (D) Acetylamine |

8. 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 |

9. 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 |
-

10. 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 |
-

11. 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 |
-

12. The organism that occupies more than one trophic level in a pond ecosystem is:

- | | |
|-----------------|-------------------|
| (A) Fish | (B) Frog |
| (C) Zooplankton | (D) Phytoplankton |
-

13. **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. |
-

14. **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.

- | | |
|--|---|
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| (C) Assertion (A) is true, but Reason (R) is false. | (D) Assertion (A) is false, but Reason (R) is true. |
-

15. **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). |
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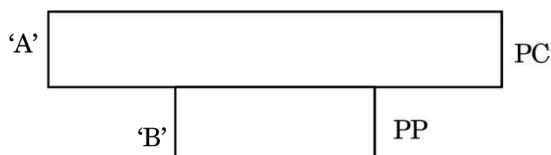
16. **Assertion (A):** Agrobacterium tumefaciens is a pathogen of several monocot plants.

Reason (R): It is able to deliver a piece of DNA known as 'T-DNA' to transform normal plant cells into a tumor.

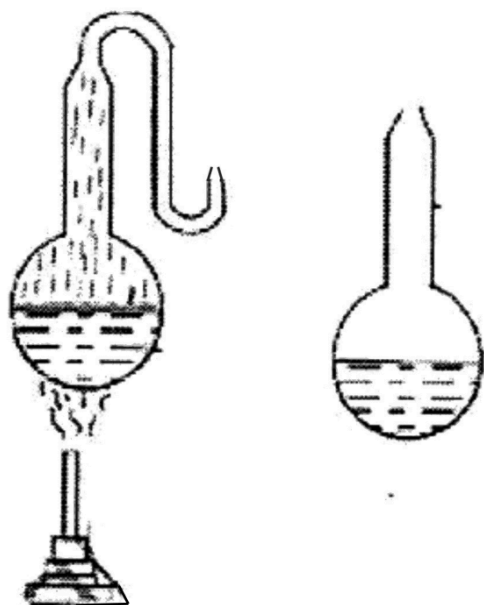
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Section B

17. Study the diagram of a pyramid of biomass given below. Name the two standing crops that could be occupying level 'A' and level 'B' in it. Name this type of pyramid and the ecosystem in which it is found.



18. Given below is an illustration of the experiment performed by Louis Pasteur. Explain the experiment and its conclusion.



19. Identify A, B, C and D in the table given below:

Terms Part of the plant it represents

Pericarp - 'A'

'B' - Cotyledon in seed of grass family

Embryonal axis - 'C'

'D' - Remains of nucellus in a seed

20(a). '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.

OR

20(b). Identify A, B, C and D in the following table:

Scientific name of source plant - Drug - Harmful effects / Body part affected

1. Papaver somniferum - 'A' - Depressant/slows down body functions

2. Cannabis sativa - 'B' - 'C'

3. Erythroxylum coca - Cocaine - 'D'

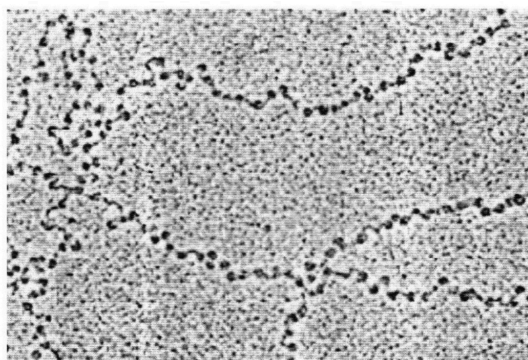
21. Write the basic steps followed in the Assisted Reproductive Technologies (ART) programme to help childless couples. Why is it also known as test tube baby programme?

Section C

22(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.

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

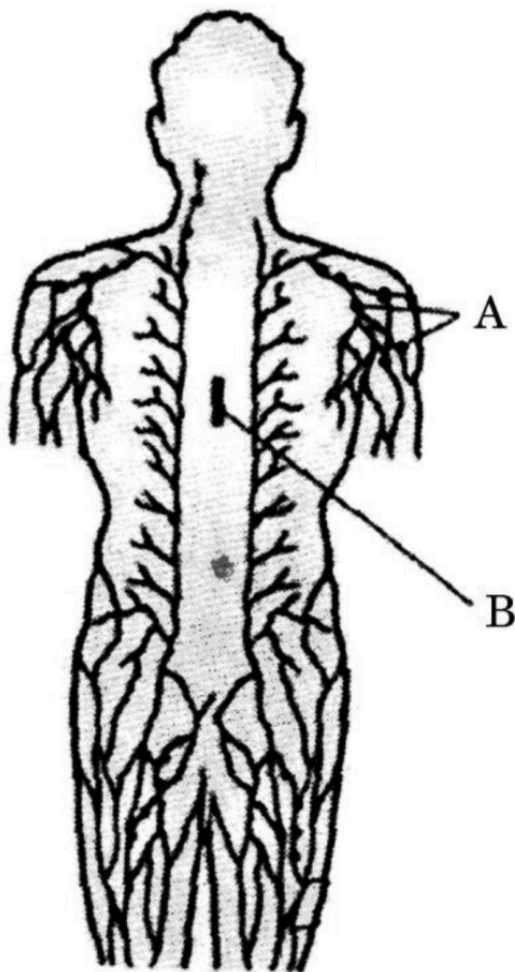
23(a). Identify the picture given below and name the tool under which it was viewed.



23(b). What do the dark spots represent in the picture? Explain how and why are they formed.

24. 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.

25. Identify A and B in the diagram below. Explain their role in the immune system of the body.



26(a). Explain how it is ensured that the orchid *Ophrys* is pollinated by a specific species of bee.

26(b). Describe co-evolution with the help of this example.

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

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

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

OR

28(b)(i). Explain the convention for naming *EcoRI*.

OR

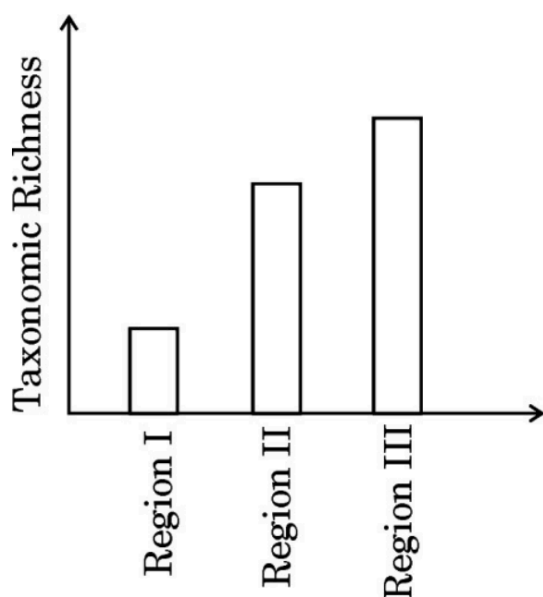
28(b)(ii). With the help of an illustration only, show the action of *EcoRI* on a DNA Polynucleotide.

Section D

29(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:



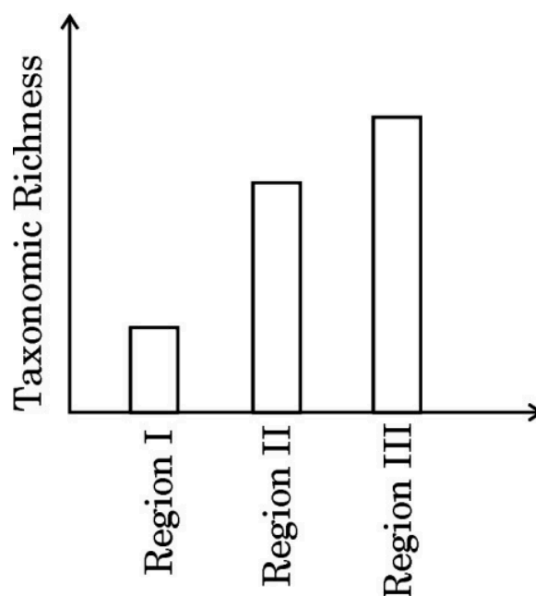
Why is the species richness maximum in Region III in the bar graph?

OR

29(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.

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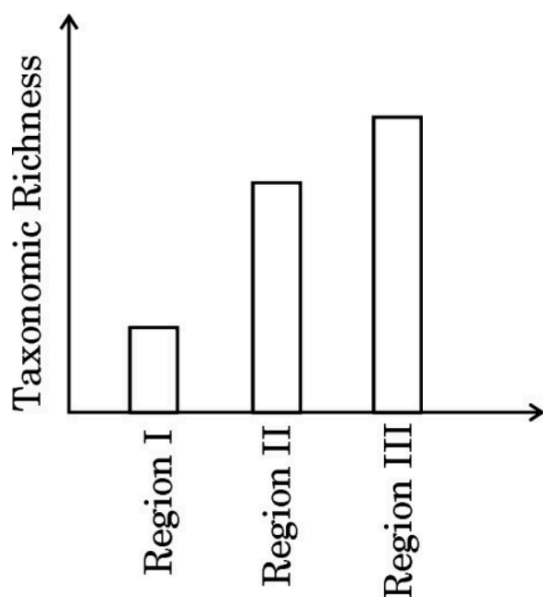


Why is the species richness minimum in Region I in the bar graph?

29(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:

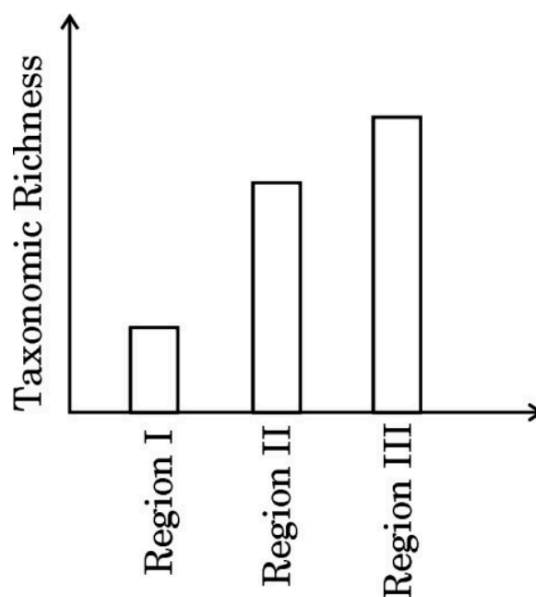


Plants and animals do not have uniform diversity in the world but show rather uneven distribution. Mention what this kind of diversity is referred to as.

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

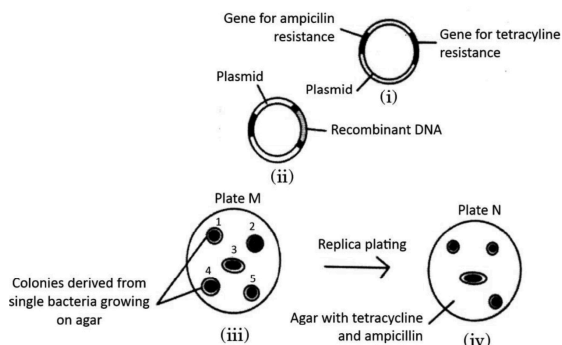
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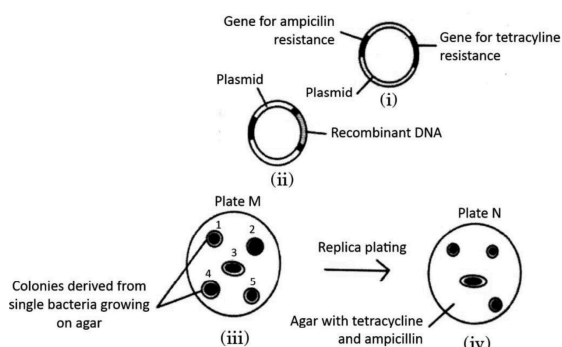
Why is it that prokaryotes do not have an estimated number of their species diversity as seen in plants and animals? Explain.

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



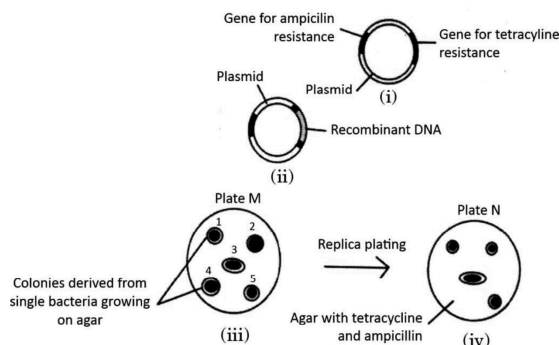
Identify the colony that has got transformed. Justify your answer.

30(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.

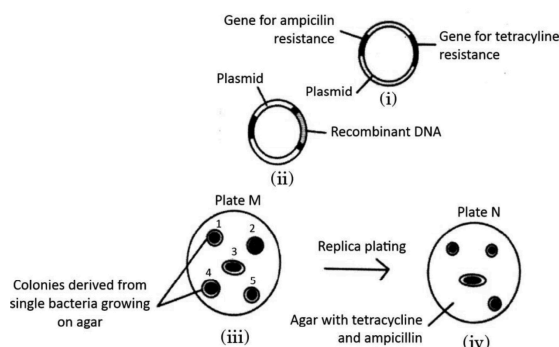
30(c). Study the diagram given below that shows the steps involved in the procedure of selecting transformed bacteria and answer the questions that follow:



Name two enzymes playing an important role in genetic engineering.

OR

30(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.

Section E

31(a)(i). Draw a labelled diagram of the embryonic stage that gets implanted in the human female leading to pregnancy.

31(a)(ii). 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.

31(a)(iii). Mention the role of the following:

- (1) Placenta
- (2) Three germ layers

OR

31(b)(i). Why do plants like Viola and Oxalis give assured seed sets even in the absence of pollinators? When an orange seed is squeezed, many embryos of different shapes and sizes are observed. Why?

OR

31(b)(ii). Mention four advantages of seed formation to angiosperms.

OR

31(b)(iii). Draw a diagram of a fertilized embryo sac of an angiosperm and label any four parts.

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

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

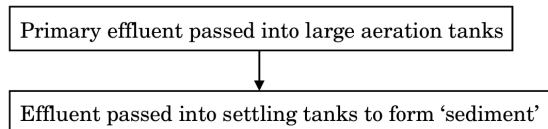
32(a)(iii). State the role of the following techniques in detection and diagnosis of cancer:

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

OR

32(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:

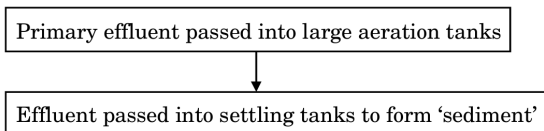


- (1) Why is primary effluent passed into large aeration tanks?
- (2) What is the 'sediment' formed, referred to as? Mention its significance.
- (3) Explain the final step in the settling tank before the treated effluent is released into water bodies.

OR

32(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.

33(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

33(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.

- End of Question Paper -