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(Held in 2021)

BOTANY

(Major)

Paper : 5.3

(Cytogenetics, Plant Breeding and Biometrics)

Full Marks : 42

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

GROUP—A

(*Marks* : 21)

1. Choose the correct answer :   1×2=2

   (a) In trisomy, the number of chromosomes can be written as

   (i) $2n - 1$

   (ii) $2n + 1$

   (iii) $2n - 3$

   (iv) $2n + 3$

(*Turn Over*)

(b) A mechanism that can cause a gene to move from one linkage group to another is

    (i) translocation

    (ii) duplication

    (iii) crossing-over

    (iv) inversion

2. Answer the following as directed :   2×2=4

(a) In Drosophila, sex is determined by

    (i) X and Y chromosomes

    (ii) ratio of pairs of X-chromosomes to the pairs of autosomes

    (iii) ratio of number of X-chromosomes to the sets of autosomes

    (iv) None of the above

        (Choose the correct answer)

(b) On the basis of Mendel's observations, predict the results from the following crosses with peas :

    (i) A tall (dominant and homozygous) variety crossed with a dwarf variety.

    (ii) The progeny of (i) crossed with the original dwarf parent.

3. Answer any *three* of the following :   5×3=15

(a) Discuss the outcomes of Mendel's experiment briefly with the help of suitable schematic diagrams.

(b) Define the following :
Recurrent and Non-recurrent parent, BC2

(c) Write a short note on heterosis or inbreeding depression.

(d) Define Hardy-Weinberg equilibrium. What assumptions must be met for a population to be in Hardy-Weinberg equilibrium?

(e) With the help of appropriate diagrams, discuss paracentric and pericentric inversion.

GROUP—B

(*Marks* : 21)

4. Answer any *three* of the following questions :

7×3=21

(a) How would you test to see if two genes are linked? What is the relationship between centiMorgan and recombination frequency? What effect does crossing-over have on linkage? Discuss how the linked genes segregate together while crossing-over produces recombination between them. 2+1+1+3=7

(b) What are autopolyploids? Explain why autopolyploids are usually sterile, whereas allopolyploids are often fertile. Discuss the role of allopolyploids in evolution. 1+3+3=7

(c) Define hybridization. Describe in brief the various steps in hybridization process. Does selection play any role in the final outcome of hybridization experiment? Discuss. 1+4+2=7

(d) How is the Chi-square goodness of fit test used to analyse genetic crosses? What does the probability associated with a Chi-square value indicate about the result of a cross? 5+2=7

(e) Answer the following : 3+2+2=7

    (i) Why do species do have a characteristic number of chromo-somes? Why is it not like some individual of the same species have $2n = 18$ and other have $2n = 24$?

    (ii) Trisomics have more developmental problems than triploids. Can you suggest a reason why?

    (iii) Geneticists often carry out reciprocal crosses when they are studying the inheritance of traits. Why do geneticists use reciprocal crosses?

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