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BOTANY

(Major)

Paper : 5.3

(Cytogenetics, Plant Breeding and Biometrics)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Fill in the blanks/Choose the correct answer :   1×7=7

   (a) One important type of gene interaction in which one locus masks/ inhibits the expression of a non-allele or genotype at a distant locus; such interaction is called _____.

   (b) Garden pea (*Pisum sativum*) contains _____ pairs of chromosomes.

   (c) Polytene chromosome found in _____.

(*Turn Over*)

(d) Down's syndrome is resulted from trisomy of chromosome number _____.

(e) When both alleles of a pair are fully expressed in a heterozygote, they are called _____ alleles.

(f) The cross of an F_1 hybrid to recessive parent is known as _____.

(g) Male sterility is controlled by

  (i) nuclear genes only

  (ii) cytoplasmic factors only

  (iii) both nuclear genes and cytoplasmic factors

  (iv) None of the above

2. Answer the following briefly : $2 \times 4 = 8$

(a) Differentiate between dominance and co-dominance.

(b) Mention the processes by which polyploids might occur in nature.

(c) How does colchicine treatment result in chromosome doubling?

(d) A colour-blind child is born to a normal couple. Work out a cross to show how it is possible.

(*Continued*)

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

$5 \times 3 = 15$

(a) Define extra-chromosomal inheritance. Which cell organelles are involved in extra-chromosomal inheritance? Differentiate between maternal effect and extra-chromosomal inheritance.

$1+2+2=5$

(b) How euploids differ from aneuploids? Give some examples of commercially successful polyploids.

$2+3=5$

(c) Discuss the significance of chromosome inversions and translocations in evolution.

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(d) Define linked genes. Distinguish between complete linkage and incomplete linkage.

$2+3=5$

(e) Discuss the importance of backcross method in plant breeding.

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

$10 \times 3 = 30$

(a) Define crossing-over. Write about the importance of crossing-over. In which stage of meiosis crossing-over takes place? Discuss in brief, the cytological basis of crossing-over.

$2+2+1+5=10$

(b) What is hybridization? Describe in brief various steps involved in hybridization. Mention the difficulties associated with distant hybridization. 2+6+2=10

(c) Define heterosis and inbreeding depression. Mention some important manifestations of heterosis. Discuss about the application of heterosis in crop improvement with suitable examples. 2+2+6=10

(d) Which agency in India functions as central agency for introduction of economically important germplasms? Why is quarantine necessary for plant introduction? Discuss in brief the objectives and procedure of plant introduction. 2+2+6=10

(e) Write explanatory notes on any *two* of the following : 5×2=10

    (i) Hardy-Weinberg equilibrium

    (ii) Non-Mendelian inheritance

    (iii) Chi-square test for goodness of fit

    (iv) Standard deviation

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