

QUESTION BANK
SEMESTER IV
CORE COURSE-10
GENETICS (BOT-A-CC-4-10-TH)

GENETICS:-

1. Answer the following questions:

x2

- a) Distinguish between crossing over and reciprocal translocation.
- b) Why is frame shift mutation more harmful than base pair substitution?
- c) What are homeotic genes? Give examples.
- d) What is FISH?
- e) What are 'split genes'?
- f) What are the gametes from AaBbCc
- g) What is the maximum frequency of recombination between two linked genes?
- h) What is tautomerism?
- i) What are transposons?
- j) Differentiate between dominance and Epistasis.
- k) A plant has a chromosome number $2n = 14$. What is its linkage group?
- l) What is an 'overlapping gene'? Give an example.
- m) Name an enzyme involved in photoreactivation
- n) Give an example of a type of gene interaction that can modify the Mendelian Dihybrid ratio.
- o) Differentiate between euchromatin and heterochromatin.
- p) What are polytene chromosomes?
- q) Differentiate between triploids and trisomics.
- r) What are 'jumping genes'? Who discovered it?
- s) What is meant by tandemly repetitive DNA?
- t) What is a 'test- cross'?

2. Discuss in brief/Write short notes on :

x5

- a) Meiotic behaviour of chromosomes showing paracentric and pericentric inversions with diagrams.
- b) The Mechanism of DNA repair.
- c) Ac-Ds system in maize.
- d) Describe the meiotic behaviour of the chromosomes in a plant showing trisomy.
- e) Describe the process, with example, by which Autotetraploids and Allotetraploids are formed in nature .
- f) Polygenic inheritance in plants
- g) Explain the ABC model of flower development in *Arabidopsis*.
- h) Mention the experimental proof that showed that crossing over involves the physical exchange of segments of homologous chromosomes during meiosis.
- i) Cytological basis of crossing over.
- j) Describe the Molecular basis of Tautomerisation

3. Answer the following :

a) Distinguish between euploidy and aneuploidy. Describe the different types of aneuploidy, their origin and their meiotic behaviour. Site examples to show how amphidiploidy plays important role in the origin of a new species. 1+5+4

b) Explain the 'Holliday model' of crossing over. Explain the 'One gene - one polypeptide' concept? 6+4

c) Test-cross with a heterozygous plant gave the following progenies-
Tall, yellow and round-350; Dwarf, yellow and wrinkled-50; Tall, green and wrinkled-10; Dwarf, green and wrinkled-360; Tall, yellow and wrinkled-70; Tall, green and round-60; Dwarf, green and round-80; Dwarf, yellow and round-10.

Determine the gene order and construct a linkage map. Calculate the coefficient of coincidence and interference. 1+7+2

d) What is tautomerism? Briefly discuss its role in causing point – mutation. Compare the mutagenic effects of an alkylating agent and a base analogue. What is photoreactivation? 2+2+4+2

e) A plant heterozygous for AaBbCc was crossed to a homozygous recessive plant for all the 3 genes and 1000 progenies were found as mentioned:

ABC-44; abc-43; AbC-148; aBc-150; Abc-305; aBC-310; ABc-0; abC-0

i) Calculate the map distance and find out the order of the 3 genes. 2+6

ii) Prove if interference occurs during crossing over. 2

f) Differentiate between transition and transversion. What is the molecular mechanism of mutagenesis of the following mutagens:

i) UV rays ii) 5-BU iii) HNO₂ iv) Mustard Gas 2x5

g) State the difference between translocation and crossing over. Explain the origin of reciprocal translocation and the meiotic behaviour of a translocation heterozygote and its effect on pollen viability. 2+2+5+1

h) The following three recessive genes are found in plants :pl, purple leaf;gl, glossy seedling; and t, dwarf variety. A trihybrid was test crossed and the following proportions were obtained when a sample of 1000 plants were counted-

wild type (++++) - 475; pl gl t - 469; pl++ - 8; +gl t - 7; pl+t - 18; +gl+ - 23; ++t - 0; pl gl + - 0.

i) Determine the gene order and map distance. ii) Justify if there is any crossover interference. 7+3