

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

END SEMESTER EXAMINATION-2015

B.Tech. II Semester, BT&BTDD

COURSE CODE: 10B11BT411

MAX. MARKS: 45

COURSE NAME: Genetics

COURSE CREDITS: 04

MAX. TIME: 3 HRS

*Note: All questions are compulsory.***Section A****(1 x 9 = 9 marks)**

- Is it possible for a species that is haploid throughout most of its life to undergo meiosis? Justify your answer.
- What is the maximum number of Barr bodies in the nuclei of human cell with the following chromosome composition: - i) XXX ii) XYY. Justify your answer.
- A man has attached chromosome 21. If his wife is cytologically normal, what is the chance that their first child will be normal (show your work)?
- What is the evidence of linkage between two genes?
- Due to certain mutations a nucleotide sequence UUGC~~U~~AUA changes to UUUGC~~U~~AUA. Identify the nature of mutation.
- Why endosymbiotic theory is relevant to study extranuclear DNA in eukaryotic organelles?
- Which one of the two – i) continuous or ii) discontinuous is most likely the result of polygenic inheritance?
- Although XYY men are phenotypically normal, would they be expected to produce children with sex chromosome abnormalities than XY men. Explain.
- What will be the possible offspring-genotypes of a marriage between a woman of blood group A whose father was group O and her husband of group AB.

Section B**(3x4.5=13.5 marks)**

Q2: Drosophila females heterozygous for three recessive x-linked genes, y (yellow body), ct (cut wings), and m (miniature wings) and their wild type alleles were crossed to y ct m males. The following progeny were obtained:-

Phenotype class	Number	Phenotype class	Number
1. yellow, cut, miniature	32	5. miniature, +, +	10
2. wild type (say +, +, +)	35	6. yellow, cut, +	7
3. yellow, +, +	12	7. yellow, miniature, +	2
4. cut, miniature, +	14	8. cut, +, +	2

- Which classes are parental type? ii) Which classes represent double crossovers? iii) Which gene is in the middle of the either two? iv) What was the genotype of the heterozygous females used in this cross? (4.5)

Q3: i) What are the major regulatory check points in the cell cycle and explain their role?

PTO

ii) Is segregation possible between the two allelic genes present on the same chromosome? Explain with the help of an example. (2.5+2)

Q4: i) The allele for the ability to roll over tongue is dominant over non-rollers? In a population of 100 people, 20 are non-rollers. How many people would you expect to be homozygous dominant? and heterozygous for this trait?

ii) Why *Drosophila melanogaster* is a model organism to study genetics and developmental biology? (2.5+2)

Section C

(5X 4.5 = 22.5 marks)

Q5: Illustrate and explain the significance of lampbrush and polytene chromosomes. (4.5)

Q6: i) What are the assumptions to Hardy-Weinberg equilibrium?

ii) What is the frequency of heterozygotes - Tt in a randomly mating population, if the frequency of recessive phenotype (tt) is 0.04? (3+1.5)

Q7: i) A cell with three pairs of homologous chromosomes:- one telocentric, one submetacentric, and one metacentric divides meiotically. Draw the following stages of the cell:- a) Metaphase I, b) Metaphase II, c) Anaphase II

ii) What is the significance of Morgan's early work on linkage studies in *Drosophila*? (2.5+ 2)

Q8: i) A woman with X-linked color blindness and Turner syndrome has a colorblind father and a normal mother. In which of her parents did nondisjunction of the sex chromosomes occur? Justify your answer.

ii) What are the chromosomal abnormalities (aberrations) with respect to number in human beings? Support your answer with examples. (2.5+ 2)

Q9: i) What are similarities and dissimilarities between nuclear and cytoplasmic inheritance? Support your answer with suitable examples.

ii) A plant species A shows 10 bivalents of chromosomes at metaphase of meiosis I; plant species B shows 16 bivalents at this stage. The two species are crossed and the chromosome number is doubled and offsprings are obtained. How many bivalents will be seen at Metaphase of meiosis I in offsprings and why? (3+1.5)

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