

A 311

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Third Semester

Industrial Bio-Technology

IB 233 — GENETICS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define locus and allele.
2. What advantages were provided by Mendel's choice of the garden pea in his experiments?
3. Contrast incomplete dominance and codominance.
4. Differentiate between linkage and crossing over.
5. What is a synkaryon?
6. Define interference.
7. What do you mean by Lygaeus on XX/XY type of sex determination?
8. What is cotransduction?
9. What are C-banding and G-banding techniques?
10. Design dosage compensation.

PART B — (5 × 16 = 80 marks)

11. (i) Four O'clock plants have a gene for colour and a gene for height with the following phenotypes :

RR — red flower

TT — tall plant

Rr — pink flower

Tt — medium height

rr — white flower

tt — dwarf plant

If a dihybrid plant is self fertilized give the proportions of genotypes and phenotypes produced. Give the outcome of the cross between the dihybrid and also the outcome of the testcross.

(4)

- (ii) When studying an inherited phenomenon, a geneticist discovered a phenotypic ratio of 9 : 6 : 1 among offspring of a given mating. Give a simple genetic explanation for this result. How would you test this hypothesis? (4)
- (iii) Black pelage in guinea pigs is a dominant trait, white is the recessive trait. When a pure black guinea pig is crossed to a white one, what fraction of the black F₂ is expected to be heterozygous. (4)
- (iv) The genes dumpy (dp), clot (cl) and apterous (ap) are linked on chromosome 2 of *Drosophila*. In a series of two-point mapping crosses, the following genetic distances were determined :

dp - ap 42

dp - cl 3

ap - cl 39

What is the sequence of the three genes? (4)

12. (a) Write short notes on the following :
- (i) Lyon's hypothesis
 - (ii) Three point cross
 - (iii) Transformation
 - (iv) Barr body.

Or

- (b) Describe the packaging of genetic material in an eukaryotic chromosome.
13. (a) Describe two experimental evidence to confirm DNA as the genetic material.

Or

- (b) What is somatic cell hybridization? How is it useful in human gene mapping?
14. (a) Describe the experiment by which Creighton and McClintock illustrated the cytological basis of crossing over.

Or

- (b) Differentiate between generalized and specialized transduction which can be used in mapping studies and why?

15. (a) Describe the sex determination mechanism in humans? How can you determine whether a particular gene is X-linked or not? What are the four types of inheritance? Draw a pedigree to illustrate each class.

Or

- (b) (i) What is Hfr, fertility factor, F-pilli and merozygote? (4)
- (ii) What is interrupted mating and how is it useful in mapping genes? (4)
- (iii) What is F-duction? (4)
- (iv) In conjugation experiments, one Hfr strain should carry a gene for some sort of sensitivity so that the Hfr donors can be eliminated on selective media after conjugation has taken place. Should this loci be near or far from the origin of transfer? What are the consequences of each alternative? (4)
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