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(Printed Pages 7)

(20426) Roll No.

B.Sc. (Bio-tech.)-I Year.

3459

B.Sc. (Bio-Tech.)

Examination, April-2026

GENETICS

(B-105)

(B.Sc. Biotech.)

Time : Three Hours] *[Maximum Marks : 50*

Note : Attempt any **five** questions. **All** questions carries equal marks.

1. (a) Two black guinea pigs were mated and over several years produced 29 black and 9 white offspring. What can you conclude about the genotypes of parents and progeny? Show the cross using appropriate symbols, and explain the results. 5

P.T.O.

(b) Consider a dihybrid cross and list the diagnostic ratios for: 5

(i) independent assortment

(ii) recessive epistasis

(iii) dominant epistasis

(iv) test cross

(v) duplicate genes

2. (a) If a man of blood-group AB marries a woman of blood group A whose father was of blood-group O, to what different blood group can this man and woman expect their children to belong? Explain with reason. 5

(b) Explain the following : 5

(i) Difference between incomplete dominance and co-dominance

(ii) Multiple alleles

3. (a) Explain the roles of mutation and recombination in creating genetic variation. 5

(b) Describe how genetic material is condensed into chromosomes. Specify the different levels of chromosomal organization. 5

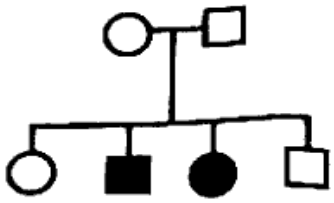
4. What is genetic linkage, and how can it be utilized for genetic mapping? If A/A. B/B is crossed with a/a. b/b and the F1 is testcrossed, what percentage of the testcross progeny will be a/a. b/b if the two genes are (i) unlinked; (ii) completely linked (no crossing over at all); (iii) 10 m.u. apart; (iv) 24 m.u. apart 10

5. Describe any two methods in detail through which genetic mapping can be done in microbes. You can explain any two methods using conjugation, transformation, or transduction. 10

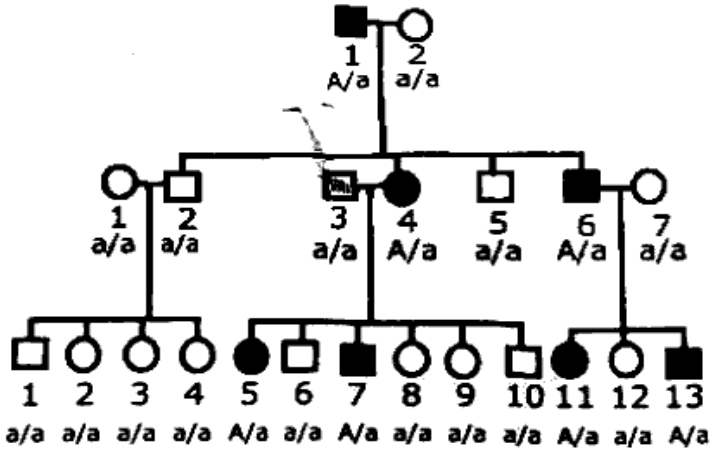
6. What is Hardy-Weinberg equilibrium? About 70 percent of all Caucasians can taste the chemical phenylthiocarbamide, and the remainder cannot. The ability to taste this chemical is determined by the dominant allele T, and the inability to taste is determined by the recessive allele t. If the population is assumed to be in Hardy-Weinberg equilibrium, what are the genotype and allele frequencies of T and t in this population? 10

7. Study the two pedigrees given below and explain what kind of disorders do you think they demonstrate (autosomal recessive/autosomal dominant/X-linked recessive/X-linked dominant). Explain the logic behind your conclusion. 10

(i)



(ii)



8. From a large-scale screen of many plants of Collinsia grandiflora, a plant with three cotyledons was discovered (normally, there are two cotyledons).

This plant was crossed with a normal pure-breeding wild-type plant, and 600 seeds from this cross were planted. There were 298 plants with two cotyledons and 302 with three cotyledons. What can be deduced about the inheritance of three cotyledons? Use appropriate symbols to show the cross and explain in detail. 10

9. (a) What are mutations? What is the difference between point mutations and chromosomal aberrations? 5

(b) What are induced mutations? Give one example each of mutagenic agents belonging to following categories 5

(i) Base analogs

(ii) Alkylating agents

(iii) Intercalating agents

10. In Drosophila, one gene pair is known to affect wing size, and the allele for normal long wings (vg+) in this gene pair has a dominant effect over the allele for short vestigial wings (vg). Another independently assorting gene pair affects body color: The allele for normal tan body color (e^+) is dominant to that for ebony body color (e). A cross is made between a fly with normal wings and ebony body color and a fly with vestigial wings and normal body color. The normal-appearing F1 are crossed among each other and 512 F2 flies are raised. What phenotypes would you expect in the F2 and in what numbers would you expect to find them? Also explain the use of chi square test in genetic mapping. 10

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