

KATHMANDU UNIVERSITY
End Semester Examination
March, 2025

Marks Scored:

Level : B.Tech.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : BIOT 202

Semester : I

F. M. : 20

Registration No.:

Date :

07 MAR 2025

SECTION "A"

[10Q. × 1 = 10 marks]

Choose and mark [X] encircle the most appropriate option from each set of choices

- Cri-du-chat syndrome is associated with
 a missing chromosome number 5.
 an additional chromosome number 5.
 a deletion of the long arm of chromosome number 5.
 a deletion of the short arm of chromosome number 5.
- An individual with two normal sets of autosomes and a single X chromosome has
 Down syndrome Patau syndrome
 Turner syndrome Klinefelter syndrome
- Consider the cross AaBb × AaBb. If trait A exhibits complete dominance and trait B exhibits co-dominance, what phenotypic ratio is expected in the offspring?
 1:1:1:1 9:3:3:1 3:6:3:1:2:1 1:2:1:2:4:2:1:2:1
- The occurrence of affected individuals in every generation in a family suggests
 an autosomal dominant trait an autosomal recessive trait
 a sex linked dominant trait a sex linked recessive trait
- Consider a sex-linked recessive trait. Which of the following crosses would produce males and females with different phenotypes?
 homozygous normal female × normal male
 affected female × affected male
 affected female × normal male
 heterozygous normal female × affected male
- If single cross over frequency between two genes r and q and q and s in 3 point mapping is 0.6 and 0.2 respectively. What will be the expected double cross over frequency?
 0.012 0.010 0.022 0.024
- Aneuploidy is usually deleterious because:
 Chromosomal pairing is hampered Gene balance is disrupted
 Size of individual may vary Chromosomal disintegration is increased
- In an experiment, you add the short arm of Y chromosome to a cell line with composition AA+ XX. What will you see?
 The cell rejects the Y chromosome The cell develop female character
 The cell develop male character The cell develop neuter gender character

9. Which of the following statements regarding Klinefelter's syndrome is **INCORRECT**?
- The fusion of an abnormal egg with normal sperm
 - The fusion of a normal egg with an abnormal sperm
 - The fusion of a normal egg with a normal sperm
 - An additional copy of X-chromosome
10. If a mother has blood group O and father has blood group A, the child being type AB, which of the following is wrong?
- The mother may have I^B allele that is passed to daughter
 - The father of the child is someone else with AB blood type
 - The child has I^A allele and also I^B allele
 - This is an abnormal case

SECTION "B"

[5 Q. \times 1 = 5 marks]

Fill in the blanks with appropriate answer.

11. If the percent recombination between X and Y is 12, between X and Z is 4, and between Y and Z is 8, then the order of the genes on the chromosome is _____.
12. Two carriers of albinism have four children. One of their children is albino and the remaining three are normally pigmented. The probability that their next child will be albino is _____.
13. Male pattern baldness is a _____ trait.
14. The number of autosomes in a human egg is _____.
15. A cross between a white eyed female drosophila and a red eyed male drosophila will produce _____ eyed males and _____ eyed females.

SECTION "C"

[5 Q. \times 1 = 5 marks]

Define the following

16. Allele:
17. Co-dominance:
18. Inversion loop:

19. Linked genes:

20. Non-disjunction:

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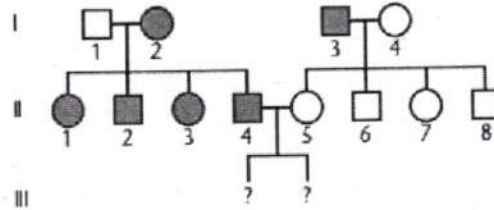
SECTION "D"

[7Q. × 5 = 35 marks]

Attempt ALL questions.

1. In a cross of *Limnaea*, the snail contributing the eggs was dextral but of unknown genotype. Both the genotype and the phenotype of the other snail are unknown. All F1 offspring exhibited dextral coiling. Ten of the F1 snails were allowed to undergo self-fertilization. One-half produced only dextrally coiled offspring, whereas the other half produced only sinistrally coiled offspring. What were the genotypes of the original parents? Explain your answer.

2. Shown below is a pedigree for a hypothetical human disorder. Analyze the pedigree and propose a genetic explanation for the nature of its inheritance. Consistent with your explanation, predict the outcome of a mating between individuals II-4 and II-5.



3. A cross in *Drosophila* involved the recessive, X-linked genes yellow (*y*), white (*w*), and cut (*ct*). A yellow-bodied, white-eyed female with normal wings was crossed to a male whose eyes and body were normal but whose wings were cut. The F1 females were wild type for all three traits, while the F1 males expressed the yellow-body and white-eye traits. The cross was carried to an F2 progeny, and only male offspring were tallied.

Phenotype	Offspring
y + ct	9
+ w +	6
y w ct	90
+ + +	95
+ + ct	424
y w +	376
y + +	0
+ w ct	0

- a. Construct a map, assuming that white is at locus 1.5 on the X chromosome.
b. Were any double-crossover offspring expected? Calculate the interference
4. Explain with proper example(s) how gene duplication favors evolution.

P.T.O.

5. In humans, the ABO blood type is under the control of autosomal multiple alleles. Color blindness is a recessive X-linked trait. If two parents who are both type A and have normal vision produce a son who is color-blind and is type O, what is the probability that their next child will be a female who has normal vision and is type O?
6. Explain Bombay Phenotype as a case of epistasis.
7. Discuss the significance of *sry* gene in humans.

SECTION "E"

8. Give **TWO** differences between **ANY FIVE** [5 Q × 2 = 10 marks]
 - a. Trisomy and Triploidy
 - b. Mitochondrial inheritance and Infectious heredity
 - c. Pericentric inversion and Paracentric inversion
 - d. Dominant lethal allele and Recessive lethal allele
 - e. Genotypic sex determination and Temperature dependent sex determination.
 - f. Transmission genetics and Population genetics

9. Explain **WHY/HOW** for **ANY FIVE** [5 Q × 2 = 10 marks]
 - a. Robertsonian translocation carriers are phenotypically normal.
 - b. Polyploids have more commercial value than their original counterparts.
 - c. The number of Barr bodies in a normal male is 0.
 - d. Monosomy in autosomes is lethal to humans.
 - e. Double cross over gametes are less frequent than non-cross over gametes.
 - f. Euphenics is an example of good use of genetics knowledge.