

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
November/December, 2023

Marks Scored:

Level : B.Tech.

Year : II

Exam Roll No.:

Time: 30 mins.

Course : BIOT 202

Semester : I

F. M. : 20

Registration No.:

Date 04 DEC 2023

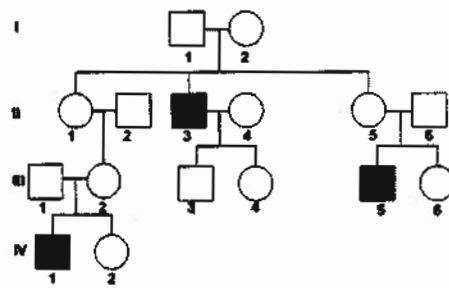
**SECTION "A"**

[20Q × 1 = 20 marks]

**Mark [X] in the most appropriate option.**

- The genotype of the parental plants producing 25 AA : 48 Aa : 26 aa offspring is  
 AA and AA       AA and aa       Aa and Aa       aa and aa
- A Klinefelter child with normal eyesight is born to a colorblind mother and a normal father. The nondisjunction occurred during  
 mother's first meiotic division       father's second meiotic division  
 mother's second meiotic division       father's first meiotic division
- A hemophilic female marries a normal male. The probability of hemophilia in their offspring is:  
 All offsprings are hemophilic       All daughters are hemophilic  
 All sons are hemophilic       50% daughters and 50% sons are hemophilic
- The recessive character typically is expressed only when present in a double recessive condition. But, a single recessive gene can express itself in humans when found on  
 either on autosome or X chromosome       X chromosome of male  
 X chromosome of female       any autosome
- The pairing of X and Y chromosomes during prophase I of meiosis is possible due to  
 the SRY gene on the Y chromosome  
 two pseudoautosomal regions on the X and Y chromosomes  
 both X and Y being autosomes  
 the Y chromosome being a shortened version of the X chromosome
- 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
- Which of the following is **NOT** a possible cause of lethality in individuals with deletion mutation?  
 Genes that are not haplo sufficient doesn't produce adequate gene product  
 Genomic imbalance  
 Unmasking of lethal recessive alleles  
 Lack of diversity
- In a linear chromosome map distance between 4 loci is as follows a-b is 10%, a-d is 3%, b-c is 4% and a-c is 6%. The crossover frequency between c and d is  
 3%       6%       9%       12%

9. Which of the following statements regarding aneuploidy is **INCORRECT**?
- arises due to the non-disjunction of homologous pair of chromosomes
  - arises due to the non-disjunction of non-homologous chromosomes
  - one gamete comes to have an extra chromosome
  - another gamete becomes deficient in one chromosome
10. Identify the mode of inheritance



- autosomal dominant
- X-linked dominant
- autosomal recessive
- X-linked recessive

**Fill in the blanks.**

11. In males, the genes for color blindness are located on \_\_\_\_\_ chromosome.
12. The probability of two yellow color mice producing a normal coat color mouse is always \_\_\_\_\_.
13. A plant with genotype AABbCC will produce \_\_\_\_\_ different kinds of gametes.
14. A trait that appears to be dominant in one sex but recessive in the other is called sex-\_\_\_\_\_ trait.
15. \_\_\_\_\_ is the unit of a genetic map.

**Define the following.**

16. Allele:
17. Maternal effect:
18. Genomic imprinting:
19. Holandric genes:
20. Reciprocal translocation:

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4 DEC 2023

Level : B.Tech.  
Year : II  
Time : 2 hrs. 30 mins.

Course : BIOT 202  
Semester : I  
F. M. : 55

**SECTION "B"**  
[7Q. × 5 = 35 marks]

Attempt *ALL* questions.

1. Discuss in detail the Robertsonian Translocation.
2. Explain uniparental inheritance with a suitable example.
3. Discuss in detail the significance of Barr bodies in humans.
4. Write short note on Temperature-Dependent Sex Determination in Reptiles.
5. 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. On the basis of the data shown here, a genetic map was constructed. [2+2+1]

PHENOTYPE	MALE OFFSPRING
y + ct	9
+ w +	6
y w ct	90
+++	95
++ ct	424
y w +	376
y ++	0
+ w ct	0

- a. Diagram the genotypes of the F1 parents.
  - b. Construct a map, assuming that white is at locus 1.5 on the X chromosome.
  - c. Were any double-crossover offspring expected?
6. In radishes, flower color may be red, purple, or white. The edible portion of the radish may be long or oval. When only flower color is studied, no dominance is evident, and red X white crosses yield all purple. If these F1 purples are interbred, the F2 generation consists of 1/4 red: 1/2 purple: 1/4 white. Regarding radish shape, long is dominant to oval in a normal Mendelian fashion. [2.5+2.5]
- a. Determine the F1 and F2 phenotypes from a cross between a true-breeding red, long radish and a radish that is white and oval. Be sure to define all gene symbols at the start.
  - b. A red oval plant was crossed with a plant of unknown genotype and phenotype, yielding the following offspring:  
103 red long: 101 red oval  
98 purple long: 100 purple oval  
Determine the genotype and phenotype of the unknown plant.

7. a. 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? [2.5]
- b. Brown eyes are a dominant eye-color allele and blue eyes are recessive. A brown-eyed woman whose father had blue eyes and whose mother had brown eyes marries a brown-eyed man whose parents are also brown-eyed. They have a son who is blue-eyed. Draw a pedigree (info above) showing all four grandparents, the two parents, and the son. Indicate each individual's possible genotypes. [2.5]

SECTION "C"

8. Give TWO differences between *ANY FIVE* [5 Q × 2 = 10 marks]
- Test cross and Back cross
  - Monosomy and Trisomy
  - Independent assortment and Recombination
  - Edwards syndrome and Patau syndrome
  - Homozygosity and Hemizyosity
  - Mendelian inheritance and Extranuclear inheritance
9. Explain WHY/HOW for *ANY FIVE* [5 Q × 2 = 10 marks]
- Color blindness is found more in males than in females.
  - Bombay phenotype is an example of epistasis.
  - Polyploidy benefits farmers.
  - Barr bodies are found in normal females but not in normal males.
  - The recombination frequency between two genes never exceeds 50%.
  - Down syndrome is not inherited