KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks Scored:

Level : B. Tech.
Year : II

Course : BIOT 202
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 05 JUN 2019

SECTION "A"
[10Q. × 1 = 10 marks]

Choose and mark [✓] in the appropriate answer.

1. Which of the following represents a testcross
[ ] Ww x WW [ ] ww x WW [ ] Ww x Ww [ ] WW x WW

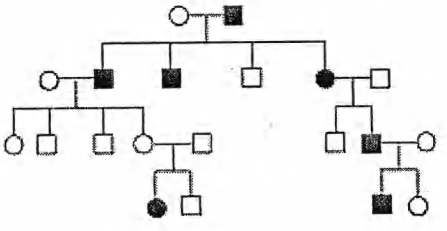
2. Carriers can also be described as _____
[ ] homozygous dominant [ ] homozygous recessive
[ ] heterozygotes [ ] hemizygotes

3. The approximate recombination frequency between two unlinked genes is _____.
[ ] 0% [ ] 25% [ ] 50% [ ] 100%

4. A gene showing codominance
[ ] has both alleles independently expressed in the heterozygote
[ ] has one allele dominant to the other
[ ] has alleles tightly linked on the same chromosome
[ ] has alleles expressed at the same time in development

5. Polyploidy refers to:
[ ] extra copies of a gene adjacent to each other on a chromosome
[ ] an individual with complete extra sets of chromosomes
[ ] a chromosome which has replicated but not divided
[ ] an inversion which does not include the centromere

6. The pattern of inheritance is
[ ] Autosomal dominant
[ ] X linked Dominant
[ ] Autosomal Recessive
[ ] X linked Recessive



7. Mr. Simpson's father and Mrs. Simpson' brother each have the same rare, autosomal recessive disorder. Mr. and Mrs. Simpson are both unaffected. What is the prior probability that both Mr. and Mrs. Simpson are carriers if the affected allele?
[ ] 4/9 [ ] 3/4 [ ] 2/3 [ ] 1/2

8. Both X linked genes and extranuclear inheritance produce different results in reciprocal crosses. How can you identify the extranuclear inheritance?
[ ] It can be transmitted from an unaffected mother to an affected son
[ ] It can be transmitted from an affected mother to an affected offspring
[ ] It cannot be transmitted from father to son
[ ] None of these

9. Genomic imprinting refers to the fact that
[ ] some proteins are made from mRNA transcribed by the mother.
[ ] one cell type follows the developmental path of another. .
[ ] programmed cell death occurs.
[ ] gene activity depends upon whether the gene is of maternal or paternal origin.

10. A pedigree chart shows:
[ ] The genotypic ratios of the offspring
[ ] The types of gametes produced by the parents
[ ] The pattern of inheritance for a specific gene
[ ] The genotypes of any parent

SECTION "B"

[5Q. × 1 = 5 marks]

Fill in the blank(s).

11. The idea that different pairs of alleles are passed to offspring independently is Mendel's principle of _____.

12. A man has six fingers on each hand and six toes on each foot. His wife and their daughter have the normal number of fingers and toes. An extra digit is a dominant trait. _____ (fraction) of the couple's children would be expected to show this condition.

13. If the genes for a trait are inherited by both men and women but only show up in the phenotype of women, they are referred to as _____ genes.

14. Hemophilia is a sex-linked recessive trait in humans. If a father and a son are both hemophiliacs, but the mother is normal, her genotype must be_____.

15. In tobacco, the diploid number of chromosomes is 48. The number of chromosomes in a pollen grain is _____.

SECTION "C"

[5Q. × 1 = 5 marks]

Define the following:

16. Recombination frequency:

17. Acrocentric Chromosome:

18. Hexaploid:

19. Expressivity:

20. Maternal Effect:

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Semester : I
F. M. : 55

SECTION "D"

Attempt *ALL* questions.

1.
   a. Discuss the phenomena of epistasis in humans with a suitable example. [3]
   b. Explain the molecular mechanism behind Barr body formation. [2]

2.
   a. In watermelons, the genes for green color and for short length are dominant over their alleles for striped color and for long length. Suppose a plant with long striped fruit is crossed with a plant heterozygous for both of these characters. What phenotypes would this cross produce and in what ratios? [3]
   b. If pale colored horses are crossed with chestnut-colored horses to produce "palomino", an intermediate coat color: [2]
      i. What type of expression is suggested?
      ii. A number of mattings between palominos produced 19 pale, 21 chestnut, and 44 palominos. Does this evidence support or contradict your answer to (i)? Why?

3. A gene called "forked" (f) produces shortened, bend or split bristles and hairs in Drosophila. Another gene called "outstretched" (os) results in wings being carried at right angles to the body. A third gene called "garnet" (g) produces pinkish eye in young flies. Wild-type female heterozygous at all three loci were crossed to wild-type male. The FI data appear below. [1+2+2]

Phenotype	Male Offspring
garnet, outstretched	57
garnet, forked	419
forked	60
outstretched, forked	1
garnet	2
outstretched	439
wild type	13
outstretched, garnet, forked	9

   a. Diagram the genotypes of the F1 parents.
   b. Construct the map.
   c. Calculate the interference involved.

4. Cystic Fibrosis is an autosomal recessive disorder that results in abnormal body secretions. A couple has a child with cystic fibrosis, and they have a child that is not affected by cystic fibrosis. The woman is pregnant with their third child. [2+1+1+1]
   a. Create a pedigree for the family describe. (Be sure to shade the affected individuals)
   b. Determine the genotypes of the family members. List the genotypes on your pedigree.
   c. What is the probability the third child will have cystic fibrosis?
   d. If the affected daughter has a child with a man who is unaffected by cystic fibrosis (and there are no known cases of cystic fibrosis in his family) what is the chance their first child will have cystic fibrosis?

5. Discuss in detail the different aspects of Extranuclear inheritance. [5]

6. Explain with a suitable example the effect of environment on phenotypic expression. [5]

7. Elaborate on the evolutionary advantages of gene duplication. [5]

8. Give *TWO* major differences between *ANY FIVE.* [5 × 2=10]
   a. Crossing over and Non reciprocal translocation
   b. Eugenics and Euphenics
   c. Back cross and Reciprocal cross
   d. Acentric and Dicentric chromosome
   e. Trisomy 21 and Trisomy 13
   f. PAR and NRY of Y chromosome

9. Explain *WHY/HOW* for *ANY FIVE.* [5 × 2=10]
   a. Males can never be homozygous for X-linked genes.
   b. The primary sex ratio in humans is greater than 1.
   c. Autogamy creates homozygosity in originally heterozygous individuals.
   d. Despite having only 45 chromosomes, people with Robertsonion translocation are phenotypically normal.
   e. Partial dominance and co-dominance inheritance patterns are similar in many aspects.
   f. People with karyotype 47, XXY are males.