KATHMANDU UNIVERSITY
End Semester Examination
March/April 2017

APR 10 2017

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

Course : BIOT 202
Semester: I
Time : 55

SECTION "D"

Attempt *ALL* questions.

1. Discuss maternal effect with respect to shell coiling pattern in *Limnaea* (snail). [5]

2. In *Drosophila*, a cross was made between females expressing the three X-linked recessive traits, *scute (sc) bristles*, *sable body (s)*, and *vermilion eyes (v)*, and wild-type males. In the F1, all females were wild type, while all males expressed all three mutant traits. The cross was carried to the F2 generation and 1000 offspring were counted, with the results shown here: [5]

S.N.	Phenotype	Offspring
1.	sc s v	314
2.	+ + +	280
3.	+ s v	150
4.	sc + +	156
5.	sc + v	46
6.	+ s +	30
7.	sc s +	10
8.	+ + v	14

No determination of sex was made in the F2 data.
i. Using proper nomenclature, determine the genotypes of the P1 and F1 parents.
ii. Determine the sequence of the three genes and the map distance between them.
iii. Are there more or fewer double crossovers than expected? Calculate the coefficient of coincidence. Does this represent positive or negative interference?

3. a. Pigment in the mouse is only produced when the C allele is present. Individuals of the cc genotype have no color (albino). If color is present, it may be determined by the A, a alleles. AA or Aa results in agouti, while aa results in black coats. [3]
   i. What F1 and F2 genotypic and phenotypic ratios are obtained from a cross between AACC and aacc mice?
   ii. In a test cross between an agouti female whose genotype was unknown and a male with the aacc genotype, the following phenotypic ratio of 9 agouti:10 black:20 albino was seen in the offspring. What is the genotype of this agouti female parent?

   b. Two mice, heterozygous for the yellow coat color trait, mate. The progeny are 2/3 yellow and 1/3 wild type color. The yellow mice are heterozygotes; the homozygous mutants died in utero. [2]
   i. Is the allele for yellow color dominant or recessive?
   ii. Is the lethality of the yellow allele dominant or recessive?

4. a. In a cross, involving parent pea plants of unknown genotype and phenotype, the following offsprings were obtained:
   3/8 full, round; 3/8 full wrinkled; 1/8 constricted round; 1/8 constricted wrinkled
   Determine the genotypes and phenotypes of the parents. [3]

b. In humans, the ABO blood type is under the control of autosomal multiple alleles. Red-green 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 type O, what is the probability that their next child will be a female who has normal vision and is type O? [2]

5. a. Discuss in detail the 14/21 translocation in humans. [3]
   b. A human female with Turner syndrome also expresses the X-linked trait hemophilia as did her father. Which of her parents underwent nondisjunction during meiosis, giving rise to the gamete responsible for the syndrome? [2]

6. a. Mrs. Smith (40 years old) and her husband have an amniocentesis for advanced maternal age. They already have four healthy children. They receive results indicating a 47, XXY karyotype. What is the phenotypic sex of the fetus? How many Barr bodies will be found in each somatic cell? Explain. [3]
   b. Discuss the molecular mechanism behind Barr body formation. [2]

7. a. Write short note on temperature dependent sex determination [3]
   b. Discuss the possible reasons, why the primary sex ratio in humans is greater than 1. [2]

8. Give *TWO* major differences between *ANY FIVE*. [5 × 2=10]
   a. Heterozygosity and Hemizygosity
   b. X-linked genes and Holandric genes
   c. Trisomy 13 and Trisomy 18
   d. Recombination and Non reciprocal translocation
   e. Uniparental and biparental inheritance
   f. Single cross over and Double cross over

9. Explain *WHY/HOW* for *ANY FIVE* [5 × 2=10]
   a. Monosomy is not tolerated by humans.
   b. Duplication of chromosomes have evolutionary advantages
   c. XY karyotype can result in female development
   d. Huntington is a dominant lethal disorder
   e. People exhibiting Bombay phenotype are genetically blood type B but phenotypically type O
   f. Mendel did not encounter linkage in his experiment.