KATHMANDU UNIVERSITY
End Semester Examination [C]
November, 2018

Marks scored:

Level : B.Tech
Year : II

Course : BIOT 202
Semester: I

Exam Roll No.: Time: 30 mins. F.M. : 20

Registration No.: Date NOV 16 2018

SECTION "A"
[20 Q.×1=20 marks]

Choose the correct answer.

1. The probability that a plant of genotype CcWw will be produced from parentalplants of genotypes CcWw and Ccww is
[ ] 1/2 [ ] 1/4 [ ] 1/8 [ ] 1/16

2. _____ investigates how and why a certain genetic variation in maintained in a population.
[ ] Cytogenetics [ ] Population genetics
[ ] Molecular genetics [ ] Mendelian genetics

3. _____ pattern of inheritance does not skip generations
[ ] Autosomal dominant [ ] Autosomal recessive
[ ] Sex linked dominant [ ] Sex linked recessive

4. Huntington disease is
[ ] Autosomal dominant [ ] Autosomal recessive
[ ] Sex linked dominant [ ] Sex linked recessive

5. The number of Barr bodies in an individual with Turner syndrome is
[ ] 0 [ ] 1 [ ] 2 [ ] 3

6. The total number of chromosomes in an individual who is a carrier for 14|21 DG translocation is
[ ] 47 [ ] 46 [ ] 45 [ ] 44

7. Complete linkage produces
[ ] Only crossover gametes
[ ] Only noncrossover gametes
[ ] Both crossover and noncrossover gametes
[ ] Four genetically different gametes

8. The conjugation between a killer and a sensitive atrain of Paramecium accompanied y cytoplasmic exchange and followed by autogamy results is
[ ] ½ killer and ½ sensitive strain [ ] ¾ killer and ¼ sensitive strain
[ ] ¼ killer and ¾ sensitive strain [ ] All killer strains

9. With two pairs of genes involved (P/p and Z/z), a test cross with an organism of unknown genotype produced the gametes in the following proportion
PZ 42.4%, Pz 9.9%, pZ 7.1% pz 43.6%. The distance between p and z is
[ ] 14 mu [ ] 15 mu [ ] 16 mu [ ] 17 mu

10. Trisomy is the condition resulting from
[ ] Euploidy
[ ] Aneuploidy
[ ] Autopoplyploidy
[ ] Allopolyploidy

11. Trisomy 13 in humans is known as
[ ] Down syndrome
[ ] Edwards syndrome
[ ] Patau syndrome
[ ] Cri-du-chat syndrome

12. Which of the following statements is TRUE?
(a) Presence of two X chromosomes determines femaleness'
(b) Presence of Y- chromosome determines maleness
(c) Absence of X-chromosome determines maleness'
(d) Absence of Y-chromosome determines femaleness
[ ] a and d [ ] a and c [ ] b and d [ ] b and c

13. Which of the following statements regarding sex-influenced inheritance is FALSE?
[ ] Expression of genes in dependent on hormonal constitution of individual;
[ ] Heterozygotes express one phenotype in one individual and contrasting in the other
[ ] Autosomal genes control the contrasting phenotype
[ ] X-linked genes control the contrasting phenotype

14. The Xg cell-surface antigen is coded for by a gene located on the X chromosome. No equivalent gene exists on the Y chromosome. Two codominant alleles of this gene have been identified: *Xg1* and *Xg2*. A woman of genotype *Xg2/Xg2* bears children with a man of genotype *Xg1/Y*, and they produce a son with Klinefelter syndrome of genotype *Xg1/Xg2/Y*. In which parent and in which meiotic division did the mistake occur?
[ ] Father in meiosis I
[ ] Father in Meiosis II
[ ] Mother in Meiosis I
[ ] Mother in Meiosis II

15. 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?
[ ] DD and dd [ ] DD and Dd [ ] Dd and Dd [ ] dd and dd

16. The term' inversion heterozygotes' refers to
[ ] Organism with one inverted and one not inverted chromosome
[ ] Organism with both chromosomes inverted
[ ] Organism with both chromosomes not inverted
[ ] Organism whose inverted chromosome cannot undergo crossing over.

17. A child with blood type O is born to a mother who is type A. which of the following cannot be the blood type of the child's father?
[ ] AB [ ] O [ ] A [ ] B

18. The number of different phenotypes that are produced from the cross between AaBbCc X AaBbCc are
[ ] 2 [ ] 4 [ ] 8 [ ] 16

19. The first woman to be diagnosed with Bombay phenotype was
[ ] Genetically A but functionally O
[ ] Genetically O but functionally A
[ ] Genetically O but functionally B
[ ] Genetically B but functionally O

20. Which of the following statements regarding Autopolyploid is FALSE?
[ ] They are larger than their diploid relatives.
[ ] All autopolyploid might not be commercially viable
[ ] They contain new and unique information as compared to their diploid relatives
[ ] Colchicines treatment induces autopolyploidy

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SECTION "B"

Attempt *ALL* questions

1. Define Extranuclear Inheritance? Explain in detail any one mode of such inheritance with suitable example. [5]

2. Write short note on "Genetic Advances in Agriculture." [5]

3. In Drosophila, a cross was made between females expressing the three 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]

Phenotype	Offspring
sc s v	314
+ + +	280
+ s v	150
sc + +	156
sc + v	46
+ s +	30
sc s +	10
+ + v	14

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

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

(b) List the advantages provided by Mendel's choice of garden pea in his xperiments.[2]

5. (a) Explain Lyon hypothesis with suitable example(s). [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) Write an account on Robertsonian Translocation. [3]

(b) In mice, the Sry gene is located on the Y chromosome very close to one of the pseudoautosomal regions that pairs with the X-chromosome during meiosis.Given the information, propose a model to explain the generation of unusual males who have two X chromosomes (with an Sry-containing piece of the Y attached to one X-chromosome). [2]

7. (a) Pigment in the mouse in only produces when the "C" allele is present. Individuals with cc genotype have no color. If color is present, it may be determined by "A", "a" alleles. AA or Aa results in agouti color, while aa results in black coats.

(i) What F1 and F2 genotypic and phenotypic ratios are obtained from a cross between AACC and aacc mice?

(ii) In three crosses between agouti females whose genotypes were unknown and males of the aacc genotype, the following phenotypic ratios were obtained:

(1) 8 agouti and 8 colorless
(2) 9 agouti and 10 black
(3) 4 agouti, 5 black and 10 colorless

What are the genotypes of these female parents? [3]

(b) In humans, red-green color blindness is inherited as an X-linked recessive trait. A woman with normal vision whose father is color blind marries a male who has normal vision. Predict the color vision of their male and female offspring. [2]

8. Give TWO DIFFERENCES between *ANY FIVE* [5×2=10]

a) Genotypic sex determination vs. Temperature dependent sex determination
b) Monosomy vs. Partial monosomy
c) Single crossover gametes vs Double crossover gametes
d) Reciprocal cross vs. Back cross
e) Penetrance vs. Expressivity
f) Pseudoautosomal vs. Sex determining region of Y- chromosome

9. Explain WHY/HOW for *ANY FIVE* [5×2=10]

a) Chromosomal inversions have evolutionary advantages.
b) Primary sex ratio in humans is as high as 1.40 to 1.60
c) The number of recombinant gametes never exceed 50 percent.
d) Holandric genes never get expressed in females.
e) Test cross helps to determine the unknown genotype.
f) Autogamy creates homozygosity in originally heterozygous individuals.