

B.Sc. 5th Semester (Honours) Examination, 2019 (CBCS)

Subject : Zoology

BU

Paper : CC-T-12

(Genetics)

Time : 2 Hours

Full Marks : 40

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Group-A

1. Answer any five questions:

2×5=10

- (a) Compare monoploid with haploid.
- (b) Two students, A and B performed test-cross in dihybrid cross. The phenotypic ratio of test cross was 1:1:1:1 for A and 3:1:1:3 for student B. Their teacher accepted both the result as correct. How did he/she explain the result.
- (c) Write the role of XIST in X-chromosome inactivation.
- (d) You analyse three pieces of double-stranded DNA, viz., A, B and C, with 50%, 40%, and 30% GC content respectively. Which of the DNA is most sensitive to UV-light damage and why?
- (e) Explain the following:
 - (i) 48, XY + #7, #20.
 - (ii) 2AXXY *Drosophila*
- (f) The autosomal recessive *tra1* mutation converts normal female into sterile male *Drosophila*. A female *Drosophila*, heterozygous for *tra1* allele is mated with normal male homozygous for *tra1* (*tra1/tra1*). What will be the sex ratio of their offspring?
- (g) Differentiate between retroposon and retro-transposon.
- (h) What do you mean by hybrid dysgenesis?

Group-B

Answer any two questions from the following:

5×2=10

2. What are sex limited traits? How do they differ from sex linked traits? Explain using suitable example. 1+2+2=5
3. With a flow diagram, discuss Holliday model of crossing over. What is interference? 4+1=5
4. Discuss how UV-irradiation causes DNA damage and mutation:
A double stranded DNA with the sequence of 5' ATTAACGGA3'/3'TAATTGCCT5' is incubated with 2-aminopurine and 5-bromouracil for one round of replication. Assume that 50% base-analogues are incorporated. The base analogues are removed and the DNA is replicated for two more rounds. What final DNA sequences will result? (Use P for 2AP and B for 5-BU). 3+2=5
5. Describe different types of hyperaneuploidy with one suitable example of each. Comment on nullisomy. 3+2=5

Group-C

Answer any two questions:

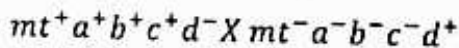
10×2=20

6. Describe in detail the molecular mechanism of sex-determination in *Drosophila*.

What would be the gender of an XY individual homozygous for non-functional mutant alleles of *sox9*? Why is SRY, rather than Sox9, considered the male determining factor? 6+2+2=10

7. Construct a cross to prove that shell coiling in gastropoda is determined by the mother genotype. What is cytohet?

Consider the following cross in *Chlamydomonas reinhardtii*:



where *a* and *b* are nuclear genes and *c* and *d* are chloroplast genes. What is the genotype of the

(a) zygote and

(b) meiotic products?

7+1+2=5

8. Write general characteristics of transposable element. Discuss McClintok's experiment with conclusion on Ac-Ds element in maize.

Mention the function of LTR in transposon. Define processed pseudogene.

3+5+1+1=10

9. *Drosophila* the genes *ct* (cut wing margin), *y* (yellow body) and *v* (vermilion eye colour) are X linked. Female heterozygous for all three markers were mated with wild type males and the following progenies were obtained. {(+) sign is for wild type allele):

Wild type female-1024

<i>ct</i>	<i>y</i>	<i>v</i>	4
<i>ct</i>	<i>y</i>	+	93
<i>ct</i>	+	<i>v</i>	54
<i>ct</i>	+	+	349
+	<i>y</i>	<i>v</i>	331
+	<i>y</i>	+	66
+	+	<i>v</i>	97
+	+	+	6
Total			1000

- (a) Construct the cross.
 (b) What are the order of genes?
 (c) Draw the genetic map of the genes.
 (d) Calculate the coefficient of coincidence for these three loci.

$$4+2+2+2=10$$
