

**M.Sc. 3rd Semester Examination, 2023**

**ZOOLOGY**

PAPER—304(CBCS)

*Full Marks : 50*

*Time : 2 hours*

*The figures in the right hand margin indicate marks*

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

**PAPER-304.1**

*(Genetics)*

1. Answer any *two* questions from the following : 2 × 2

(a) What is incomplete penetrance ? Give an example.

*( Turn Over )*

- (b) What is variable expressivity ? Give an example.
- (c) Name two dominant and two recessive traits in human being.
- (d) How can you determine X-linked recessive pedigree ?

2. Answer any *two* questions from the following :

4 × 2

- (a) Voles are trapped in old fields in Indiana and were genotyped for a transferrin locus. The following number of genotypes were recorded where  $T^E$  and  $T^F$  represent different alleles

|           |           |           |
|-----------|-----------|-----------|
| $T^E T^E$ | $T^E T^F$ | $T^F T^F$ |
| 407       | 170       | 17        |

Calculate the genotypic and allelic frequencies of transferrin locus.

(b) A normal woman whose mother was colorblind has sons. Nothing is known of the color-vision phenotype of the father. What is the probability that the son will be colorblind ?

(c) Perform a chisquare test to determine if an observed ratio of 30 tall : 20 dwarf pea plants is consistent with an expected ratio of 1 : 1 from the cross  $Dd \times dd$ .

(d) How can you determine the sex of *Drosophila* by using crosses between triploid female and diploid male.

3. Answer any *one* question from the following :

8×1

(a) What is epistasis ? Explain epistasis with a classic example from the work of Bateson and Punnet who studied the genetic control of flower color in the sweat pea, *Lathyrus odoratus*.

(b) Chickens that carry both the alleles for rose comb (R) and pea comb (P) have walnut combs, whereas chicken that lack both of these alleles (rrpp) have single combs. From the information about interactions between these two genes, determine the phenotypes and proportions expected from the following crosses :

(i)  $RR Pp \times rr Pp$

(ii)  $rr PP \times Rr Pp$

(iii)  $Rr Pp \times Rr pp$

(iv)  $Rr pp \times rr pp$

## PAPER-304.2

*(Basic and Applied Immunology)*

4. Answer any *two* questions : 2 × 2

(a) What are immunogen and haptens ? Give examples.

- (b) Write the characters of haematopoietic stem cells (HSC).
- (c) What are primary and secondary lymphoid organs ? Give example.
- (d) Differentiate innate and adaptive immunity.

5. Answer any *two* questions from the following : 4 × 2

- (a) What are the different strategies of innate immune response ? Elaborate.
- (b) Describe the structure of Immunoglobulin with suitable diagram.
- (c) What do you mean by cytokines and chemokines ? Give examples.
- (d) Name the enzymes commonly used in ELISA. Describe the process of ELISA with proper illustrations. 1 + 3

6. Answer any *one* question from the following: 8 × 1

(a) (i) What is macrophage? State the process of phagocytosis with diagram.

(ii) Describe the structure of Major histocompatibility complex. 1 + 3 + 4

(b) (i) Illustrate the mechanism of acquired immune response.

(ii) What do you mean by inflammation? 6 + 2

[ **Internal Assessment – 10 Marks** ]

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