

**Total Pages—8 PG/IIIS/ZOO/304.1 & 304.2/24  
(CBCS)**

**PG 3rd Semester Examination, 2024**

**ZOOLOGY**

**PAPER — ZOO-304.1 & 304.2 (CBCS)**

*Full Marks : 50*

*Time : 2 hours*

**Answer all questions**

*The figures in the right hand margin indicate marks*

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

*Illustrate the answers wherever necessary*

**PAPER : ZOO-304.1**

*( Genetics )*

**GROUP — A**

**1. Answer any two of the following questions :**

**2 × 2**

*( Turn Over )*

( 2 )

- (a) Distinguish between incomplete penetrance and variable expressivity. Give example.
- (b) Flower color in a garden plant is under the control of a gene with multiple alleles. The phenotypes of the homozygotes and heterozygotes of this gene are as follows :

Homozygotes

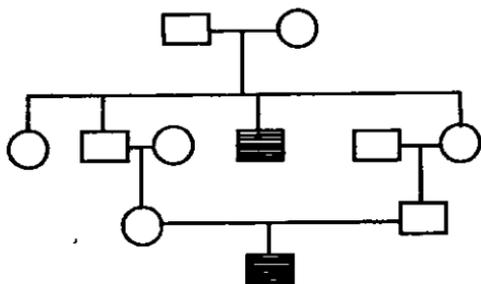
- WW – red  
ww – pure white  
 $w^s w^s$  – white stippled with red  
 $w^p w^p$  – white with regular red patches

Heterozygotes

- W with any other allele – red  
 $w^p$  with  $w^s$  or  $w$  – white with regular red patches  
 $w^s w$  – white stippled with red  
Arrange the alleles in dominance hierarchy.

- (c) Is this trait is segregating in the following pedigree due to a dominant or a recessive allele?

( 3 )



- (d) Predict the sex of *Drosophila* with the following chromosome composition (A=haploid set of autosome).  
 $4 \times 4A, 3 \times 4A, 2 \times 3A, 1 \times 3A$

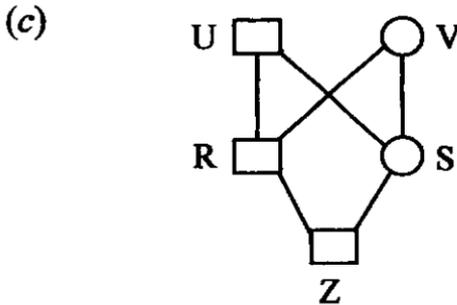
GROUP – B ●

2. Answer any *two* questions from the following :  $4 \times 2$
- (a) In human beings, a recessive X-linked mutation, *g*, causes green-defective color vision, the wild-type allele, *G* causes normal color vision. A man(a) and a woman(b), both with normal vision, have three children. All children married to people with normal vision :

- (i) One daughter child with normal vision produces six normal sons.
- (ii) One daughter child with normal vision produces one color defective son and two normal son.

Show the genotypes of all generations.

- (b) Rose comb chicken mated with walnut-comb chickens produces 15 walnut, 14 rose, 5 pea and 6 single comb chicks. Determine the genotype of the parents.



Calculate the inbreeding coefficient following the procedure developed by Wright and Cotterman.

( 5 )

- (d) Recombination rates between three loci in corn are shown here :

Loci	Recombination Rate
R and W <sub>2</sub>	11%
R and L <sub>2</sub>	28%
W <sub>2</sub> and L <sub>2</sub>	17%

Determine the order of the genes on the chromosome.

GROUP – C

3. Answer any *one* question from the following : 8 × 1
- (a) Mendel test-crossed pea plants grown from yellow round F<sub>1</sub> seeds to plants grown from green, wrinkled seeds and obtained the following results : 31 yellow round; 27 yellow wrinkled; 26 green round; 26 green wrinkled. Are these results consistent with the hypothesis that seed

color and seed texture are controlled by independently assorting genes, each segregating two alleles ?

(b) Two plants with white flowers, each from true-breeding strains, were crossed. All the  $F_1$  plants had red flowers. When these  $F_1$  plants were intercrossed, they produced 177 red flower plants and 142 white flower plants in  $F_2$ .

(i) Propose an explanation for the inheritance of flower color.

(ii) Propose a biochemical pathway for flower pigmentation and indicate which genes which steps in this pathway.

**PAPER : ZOO-304.2**

( *Basic and Applied Immunology* )

GROUP – A

4. Answer any *two* questions from the following : 2 × 2
- (a) “All immunogens are antigen but some antigens are not immunogen” – Explain.
  - (b) What are affinity and avidity ?
  - (c) Write the function of RBC and platelets.
  - (d) What is passive immunity ? Explain with an example.

GROUP – B

5. Answer any *two* questions from the following : 4 × 2
- (a) Describe the structure of Class I MHC molecule with suitable diagram.
  - (b) Write the principle of Immunohistochemistry (IHC). Describe direct immunohistochemistry (IHC) in brief with proper diagram. 3 + 1

- (c) Enumerate the structure and functions of IgA with labelled diagram.
- (d) Compare between humoral and cell-mediated immunity.

GROUP – C

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

(a) What are primary and secondary lymphoid organs ? Give example. Describe the structure of any one lymphoid organ with labelled diagram. What is epitope ?

2 + 5 + 1

(b) Write notes on (any two) :

4 + 4

- (i) Titer
- (ii) NK Cell
- (iii) ELISA
- (iv) T-cell
- (v) Phagocytosis.

**[ Internal Assessment – 10 Marks ]**

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