

U.G. 6th Semester Examination - 2022

Molecular Biology

[PROGRAMME]

Discipline Specific Elective (DSE)

Course Code : MBG-601&602-T-DSE-4

Full Marks : 40

Time : 2½ 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.

Answer all the questions from selected option.

OPTION-A

MBG-601-T-DSE-4

(Inheritance Biology)

1. Answer any **five** of the following : 2×5=10
- a) Draw a pedigree showing X-linked recessive inheritance pattern.
 - b) Estimate the number of barr bodies in the nuclei of human cells with karyotype XXX and XXY.
 - c) With the help of punnett square, show the utility of test cross.

- d) Determine the sexual phenotype of *Drosophila* bearing 1X:2A and 2X:2A karyotypes.
- e) Distinguish between physical map and genetic map.
- f) What are maternal effect genes? Give one example.
- g) What are true breeding varieties? State Mendel's principle of segregation.
- h) Is conjugation a sexual process? Justify your response.

2. Answer any **two** questions: 5×2=10
- a) Show a dihybrid cross where the genotypic and phenotypic ratio of the F1 offspring would be same. Attribute phenotype as per your choice.
 - b) In heterozygous condition, some genes show dominant characteristics while others are recessive. Explain the underlying molecular basis behind this observation.
 - c) Write a note on the modalities of analysis of ordered and un-ordered tetrads? Support your description with appropriate sketches.
 - d) Flower colour in snapdragon shows incomplete dominance. Red (WW) and white (ww) true breeding varieties, when crossed,

produces all pink flowers in F1 generation. The F1 plants are inter crossed and a total of 300 F2 plants are obtained. Compute the genotypic and phenotypic ratio that might be obtained in F2. Estimate the expected number of individuals in each phenotypic class. 3+2

3. Answer any **two** questions: 10×2=20

- a) Comment on the genetic system of mitochondria and chloroplast. Enumerate the salient features of extra chromosomal inheritance. Distinguish homoplasmy from heteroplasmy. 5+3+2
- b) Describe the key features of folded fibre model. Mention two advantages of having such a genetic organization. 8+2
- c) Describe generalized and specialized transduction with diagram. What is lysogeny? 8+2
- d) Describe the various types of epistatic interactions with punnett square. 10

OPTION-B
MBG-602-T-DSE-4
(Immunology)

1. Answer any **five** of the following : 2×5=10

- a) What are the basic differences between endotoxin and exotoxin?
- b) What are mast cells? Name the substances release from the mast cells.
- c) Define phagocytes.
- d) What are antigenic determinants?
- e) What is an endogenous antigen?
- f) What do you mean by immunological memory?
- g) Define cytokines.
- h) Distinguish epitope from paratope.

2. Answer any **two** questions: 5×2=10

- a) Differentiate precipitation from agglutination. What is the role of IgE in allergic reaction? 2+3
- b) What are antibody isotype? Describe their names and functions. 2+3

c) Briefly discuss the cell mediated immunity.
5

d) Classify hypersensitivity reactions. Describe
type IV hypersensitivity with proper diagram.
2+3

3. Answer any **two** questions: 10×2=20

a) Distinguish between immunogenicity and
antigenicity. What is primary immune
response? Briefly describe the process of B
cell activation with suitable diagram.
2+2+6

b) Classify autoimmune diseases. Give detail
note on systemic autoimmune diseases.
4+6

c) What are the factors that need to be taken into
consideration for immunization strategies
with a vaccine? Explain briefly about the
Attenuated vaccines. 4+6

d) Explain how antigen is processed and
presented on the surface of MHC molecule.
Write a short note on the structure of T-cell
Receptor. 5+5
