

QP Code: 22/PT/14/IIIB

POST-GRADUATE COURSE

Term End Examination — June, 2022/December, 2022

ZOOLOGY

Paper-3B : GENETICS AND MOLECULAR BIOLOGY

Time : 2 hours]

[Full Marks : 50

Weightage of Marks : 80%

Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.

1. Answer *two* questions : 9 × 2 = 18
- a) Explain how F-factor takes part in genetic exchange between bacteria during conjugation. Depending on the knowledge of chromosome organization and gene structure of eukaryotes explain the C-value paradox. What is C₀t curve ? 5 + 3 + 1
- b) What are the check-points in an eukaryotic cell cycle ? Explain the action of CDK-cyclin in cell cycle regulation. State the function of p53 and mdm2 in cell cycle. 2 + 4 + 3
- c) What is 'theta' replication and where it occurs ? Briefly describe the replisome formation and its function. State how replication occurs at the end of a chromosome. 2 + 3½ + 3½
- d) What are the functions of 3 types of RNA polymerases in eukaryotes ? Discuss different types of splicing methods with proper diagram. 3 + 6
2. Answer *three* questions : 6 × 3 = 18
- a) Discuss the structure of lampbrush chromosomes. Where are they found ? Explain chromosomal puff. 3 + 1 + 2
- b) Explain how the X : A chromosomal ratio acts as the determining factor for sex in *C.elegans*. Mention the role of HER-1 in this sex determination process. 4 + 2

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[Turn over

- c) Distinguish between C-banding, G-banding and Q-banding of chromosome on the basis of technical differences and their practical implementations.
- d) What are okazaki fragments and why they are formed ? State the role of the RNase H and ligase enzymes. What is ORC ? $2 + 3 + 1$
- e) State the roles of internal promoters, enhancers and silencers in eukaryotic transcription with examples. 2×3
- f) What is RNA interference ? State this mechanism with reference to RISC formation using proper diagram. State the significance of ribozymes. $1 + 3 + 2$
3. Answer *two* questions : $4 \times 2 = 8$
- a) What is mobile DNA element ? Explain their importance in the genome structure of an organism. $2 + 2$
- b) Discuss the structures and functions of different DNA-binding motifs with example.
- c) Discuss how c-DNA library can be constructed. State the use of RFLP. $3 + 1$
- d) Mention two of the recombination proteins and their roles in DNA repair in *E.coli*. $2 + 2$
4. Answer *two* questions : $3 \times 2 = 6$
- a) State the types of modifications in the histone tail and their significance.
- b) Define karyotype and idiogram. State their use. $2 + 1$
- c) What are the roles of f-met and Shine-Dalgarno sequence in prokaryotic translation ? $1\frac{1}{2} + 1\frac{1}{2}$
- d) Discuss briefly about the mismatch repair mechanism of DNA.
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