2022

(November)

BIOTECHNOLOGY

(Honours)

(Cell Biology and Genetics)

Marks : 56

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer Question No. **1** which is compulsory and *any* **four** from the rest

1. Briefly describe the following : 3×4=12

(a) Phospholipid bilayer of plasma membrane

(b) Dosage compensation in sex chromosomes

(c) Coupling and repulsion phases in gene linkage

(d) Balanced and imbalanced arrangements in chromosomal alterations

2. *(a)* Compare the salient features of prokaryotic and eukaryotic ribosomes. 5

   (b) It is hypothesized that eukaryotic cells evolved from symbiotic association with prokaryotes. Provide relevant examples to support this hypothesis. 6

3. *(a)* Describe a typical lampbrush chromosome. Explain the significance of lampbrush chromosomes. 2+4=6

   (b) What are chromosomes and chromatids? Describe the role of non-disjunction in Calvin Bridges' observations on eye colour of *Drosophila*. 1+4=5

4. *(a)* Explain how mutations in ABO gene result in A, B and O blood groups in humans. 6

   (b) Describe the role of cytoplasmic inheritance in shell coiling of *Lymnaea*. 5

5. *(a)* Explain how deamination, alkylation and intercalation can induce mutations in genomes. 6

   (b) Citing relevant examples, describe the cellular events that can result in monosomy and trisomy. 5

(Continued)

6. *(a)* Differentiate between euploidy and aneuploidy. Describe the different types of autopolyploids. 1+3=4

   (b) Explain how chromosomal inversions in a heterogygote can lead to chromosomal deletions in the resulting gametes. 7

7. *(a)* Differentiate between Rough Endoplasmic Reticulum and Smooth Endoplasmic Reticulum. 5

   (b) Discuss the various types of cytoskeleton structures with suitable diagrams. 6

8. *(a)* Using a pedigree chart, explain the genetic basis of X-linked recessive inheritance. 6

   (b) Discuss the roles of cyclins and cyclin-dependent kinases in regulating cell cycle. 5

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