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(July)

BIOCHEMISTRY

(Honours)

Paper : VIII

(Molecular Biology)

Marks : 56

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

Answer any **four** questions

1. (a) Why are nucleic acids the molecular repositories of genetic information in all living organisms? 5
- (b) Describe the famous work and conclusions of Avery, MacLeod and McCarty. 5
- (c) Briefly describe transposons and their significance. 4
2. (a) Why is DNA replication semi-discontinuous and semi-conservative? 4

- (b) What is the length of Okazaki fragments in prokaryotes and eukaryotes? 2
- (c) What is replisome? Mention the replisome components of *E. coli* and their functions. 5
- (d) What factors promote the fidelity of prokaryotic replication during leading strand synthesis of DNA? 3

3. (a) What are promoters? Describe the common sequences encountered in prokaryotic promoters with illustrations. 1+3=4
- (b) When a gene with the initial sequence ATGACCATGATGCCA undergoes expression, what is the initial sequence of the transcript encoded? 2
- (c) What is snRNA? Describe the role of spliceosomes in RNA processing. Mention briefly the process of RNA interference. 1+4+3=8
4. (a) Mention the codon sequences required for prokaryotic translation, initiation and termination. What catalyzes the peptide bond formation during translation and with which rRNA is it associated? 2+2=4
- (b) Why are ribosomes considered as 'supra-molecular machines'? Mention the role of *E*, *P* and *A* sites in prokaryotic ribosome. 2+3=5

(3)

- (c) Discuss the salient differences in translation in prokaryotes and eukaryotes. 5
5. (a) Describe the probable effects on gene expression in the *lac* operon of a mutation in—
- (i) the *lac* operator;
 - (ii) the *lac*-I gene that inactivates the repressor;
 - (iii) the promoter 10 region. 6
- (b) What is gene regulation? Why genes need to be regulated? Discuss various processes that maintain the steady-state level of a protein in a living cell. 1+2+5=8
6. (a) Describe the cloning of a gene using a plasmid in a bacterial system using suitable illustrations. 10
- (b) Compare and contrast between PCR and real time PCR. 4
7. (a) Discuss how recombinant DNA technology has transformed agriculture and medicine. 8
- (b) What is bioinformatics? In what way is it useful to biochemists and molecular biologists? 2+4=6

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