

2021

BIOCHEMISTRY — HONOURS

Sixth Paper

(Module – XII)

Full Marks : 50

The figures in the margin indicate full marks.

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

1. Answer **any ten** questions : 2×10
- (a) What is meant by C-value paradox?
 - (b) What is the difference between mutation rate and mutation frequency?
 - (c) Why does DNA replication require the enzyme DNA topoisomerase?
 - (d) What is the missense mutation? Explain with an example.
 - (e) Why is Chargaff's rule not applicable for RNA?
 - (f) What is satellite DNA?
 - (g) What are mutagens? Give two examples.
 - (h) What are adapters and linkers?
 - (i) What do the terms 'selectable marker' and 'reporter gene' mean?
 - (j) What are intercalating agents? Give an example.
 - (k) Differentiate between euchromatin and heterochromatin.
 - (l) What is Pribnow box?
 - (m) What is meant by cap and tail of mRNA?
 - (n) What are *cis* acting and *trans* acting elements in the context of transcription?

Unit - I

Answer **any one** question.

2. (a) Briefly describe the experimental procedure and state how the observations led to the conclusion that DNA replication occurs in semiconservative mode.
- (b) A double stranded DNA molecule is 1000000 base pair long.
- (i) How many nucleotides does it have?
 - (ii) How many complete turns are there in the helical structure?
 - (iii) What is the length of DNA molecule?

Please Turn Over

- (c) What is SOS repair system? Explain with schematic diagram.
 (d) Explain how transcription initiation takes place.
 (e) What is the significance of Avery, McLeod's experiment? (2+2) +(1+1+1) +(1+3) +2+2

3. (a) What do you mean by nucleotide excision repair? Explain by schematic diagram.
 (b) How does rolling circle DNA replication mechanism differ from the mechanism of chromosomal DNA replication? Explain your answer with a suitable diagram.
 (c) Write down the functions of the following:
 (i) Origin of replication
 (ii) Untranslated region
 (iii) Sigma factor. 4+(2+3)+(2×3)

Unit - II

Answer *any one* question.

4. (a) What are the functions of start and stop codon? Give one example of each.
 (b) Define plasmids and discuss their functions.
 (c) Give one example of how human and plant gets benefited by RDT.
 (d) What are DNA probes? Give examples of their use.
 (e) In a certain population, the frequency of 3 genotypes are as follows :

Genotypes	Frequency
BB	22%
Bb	62%
bb	16%

What is the probable frequency of the B and b alleles? $(1\frac{1}{2}+1\frac{1}{2}) +(1+2) +(1\frac{1}{2}+1\frac{1}{2}) +(1+2)+3$

5. (a) What characteristics of plasmids make them good cloning vectors?
 (b) Describe the role of t-RNA during translation.
 (c) Name and state the function of one inhibitor which blocks translation in
 (i) prokaryotes and
 (ii) eukaryotes.
 (d) Explain which type of bacterial genetic recombination involves the use of viral vector.

(3)

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- (e) A DNA molecule is subjected to single and double digestion with restriction enzymes and the following results are obtained :

Enzyme	Fragment sizes (kB)
Eco RI	2.9, 4.5, 7.4
Hind III	3.9, 6.0, 12.9
Eco RI & Hind III	1.0, 2.0, 2.9, 3.5, 6.0, 7.4

Draw a restriction map of the plasmid and indicate the location of their restriction genes and the site of enzyme cleavage.

- (f) Discuss the role of DNA ligase in Recombinant DNA Technology.
- (g) Briefly describe the mechanism of generalised transduction in bacteria. 2+2+(1+1)+2+3+2+2
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