2021

MICROBIOLOGY — HONOURS

Paper : CC-8

(Microbial Genetics)

[Units 1-5]

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.

Question no.* 1** is compulsory and answer ***any three from the rest.

1. Answer ***any ten*** questions : 2×10

(a) Distinguish between gain-of-function and loss-of-function mutation.

(b) What is meant by plasmid incompatibility?

(c) How does an Hfr cell differ from an F+ cell?

(d) Write down the characteristics of ARS.

(e) What mode of replication is used by plasmids for their propagation? Give schematic representation.

(f) What is the difference between replicative and non-replicative transposon?

(g) What do you mean by High frequency transducing lysates?

(h) Name one gram positive and one gram negative bacteria that undergo natural transformation.

(i) Distinguish between a missense and nonsense mutation.

(j) Why is a liver microsomal fraction included in the Ames test for mutagens?

(k) What are transformasomes?

(l) Write how the effect of a mutation may be suppressed.

(m) Define mutation rate and mutation frequency.

(n) Name the proteins responsible for *E.coli* genome organization.

(o) Distinguish between LINES and SINES.

2. (a) What is plasmid copy number?

(b) Briefly explain with diagram any two mechanisms by which copy number of plasmid can be controlled.

(c) What is curing of plasmids? How is it prevented?

(d) Which organism (Species) harbours Ti plasmid. Mention any one use of this plasmid. 1+4+2+3

Please Turn Over

3. (a) The sequence of nucleotides in an mRNA is 5′-AUGACCCAUUGGUCUCGUUAG-3′
Assuming that ribosomes could translate this mRNA, how many amino acids long would you expect the resulting polypeptide chain to be?
Hydroxylamine is a mutagen that results in the replacement of an A-T base pair for a G-C base pair in the DNA; that is, it induces a transition mutation. When hydroxylamine was applied to the organism that made the mRNA molecule show in part (a), a strain was isolated in which a mutation occurred at the 11th position of the DNA that coded for the mRNA. How many amino acids long would you expect the polypeptide made by this mutant to be? Why?

(b) What kind of mutation is caused by UV radiation? Draw and explain.

(c) What are mutator genes? Give an example.

(d) Distinguish between mutation suppression and reversion. 2+3+2+3

4. (a) Explain why in F+ × F-crosses, the recipient F-is converted to a donor with very High frequency but it is rare for a recipient to become a donor in Hfr × F-crosses.

(b) In *E.coli*, the following Hfr strains donate the genes shown in the order given :

Hfr Strain	Order of Gene Transfer
1	GEBDNA
2	PYLGEB
3	XTJFPY
4	BEGLYP

All the Hfr strains were derived from the same F strain. What is the order of genes in the original F chromosome?

(c) What is a merozygote?

(d) How did Benzer establish that intragenic recombination occurred within the rll locus of bacteriophage T4? 2+3+2+3

5. (a) Briefly describe the formation of a co integrate in replicative transposition mode.

(b) With the help of a diagram briefly describe the structure of an insertion sequence.

(c) Give two important consequences of transposition mechanism in cells.

(d) What are P elements? 3+3+2+2

6. (a) Name one classical experiment which established the phenomenon of transformation in bacteria.

(b) Outline the experiment using schematic representation.

(c) Describe briefly the mechanism of natural competence in bacteria. 2+4+4

7. (a) Both environmental and genetic factors are responsible for lysogenic vs. lytic cycle in phage lambda— Justify.

(b) Write down the role of Ac/Ds element in determination of maize kernel phenotypes.

(c) What is a retrotransposon? List the various classes of retrotransposons with example. 4+3+(1+2)