2018

MICROBIOLOGY — HONOURS

Fifth Paper

(Group – A)

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 six*** questions from the rest

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

(a) What do you mean by 30 nm fibre of DNA?

(b) Distinguish between a missense mutation and nonsense mutation.

(c) Determination of Cot value of a genomic DNA depends upon salt concentration of the medium. – Explain.

(d) Write down the basic differences between generalised transduction and specialised transduction.

(e) Draw a sketch of a bacterial IS element inserted in a circular plasmid. Indicate the positions of (i) the transposase gene (ii) the inverted terminal repeats and (iii) the target site duplication.

(f) Differentiate between LINES and SINES.

(g) Define segregative instability of plasmid.

(h) Write down two genetic phenomena mediated by transposable elements.

(i) If a virus particle contains double stranded DNA of length 4×10^5 bps, how many complete 360^O turns would occur in its genome?

(j) Write down one mechanism responsible for curing of plasmid.

(k) What is fertility inhibition?

(l) What makes a particular mutation to result in a temperature sensitive phenotype?

(m) Name two properties of RecA that are important for recombination.

(n) What are bypass polymerases?

(o) What is 'W' – reactivation?

2. (a) Explain the molecular basis of plasmid incompatibility.

(b) What was the objective of the experiment carried out by Hershey and Chase? 3+2

3. (a) Consider the following data generated through P1 transduction :

Donor	Recipient	Selected Marker	Unselected Marker	%
aroA pyrD$^+$	aroA$^+$ pyrD	pyrD$^+$	AROA	5
aroA cmlB	aroA cmlB$^+$	aroA$^+$	CMLB	26
cmlB pyrD$^+$	cmlB$^+$ pyrD	pyrD$^+$	CMLB	54

Derive the order of the genes.

(b) What is homologous recombination? 3+2

4. (a) The nucleic acids from various viruses were extracted to determine their base composition. Given the following results, what can you infer about the physical nature of the nucleic acids of these viruses?

(i) A = 40%, T = 40%, G = 10% and C = 10%
(ii) A = 35%, T = 15%, G = 25% and C = 25%
(iii) A = 35%, U = 30%, G = 30% and C = 5%

(b) Give the experimental evidence of the fact that the structural unit of chromosome is composed of 200 bp of DNA. 2+3

5. (a) How does a Hfr × F^- mating differ from a $F' \times F^-$ mating?

(b) Why is the experiment of Luria and Delbruck known as Fluctuation Test? 3+2

6. For each of the following lesions, indicate which repair system would be responsible for repairing the damage : 5

(a) Deamination of cytosine
(b) G:T mispair arising during DNA replication
(c) AP site
(d) O^6 – methyl guanine
(e) 5'–T–T–3' dimer.

7. (a) Explain the difference between replicative and conservative modes of transposition.

(b) An IS1 element was accidentally incorporated near an IS2 element in the *E.coli* chromosome. The gene between them was sug^+ which was responsible for metabolising certain kinds of carbohydrate. Would the unit IS1 sug^+ IS2 behave as a composite transposon. – Explain. 3+2

8. (a) How does the action and mutagenic effect of 5– bromouracil differ from that of nitrous acid?

(b) Why is a liver microsomal fraction included in the Ames test?

(c) What is a leaky mutation? 3+1+1

9. Explain the following : 2½+2½

(a) Multigene family and pseudogene
(b) VNTR and RFLP.

10. (a) If in a particular cell type, rifampicin was used to inhibit DNA transfer, what would be your conclusion regarding the transfer mechanism?

(b) RNA shows mostly C3' – endo form of ribose sugar puckering. Explain, why.

(c) Distinguish between silent and neutral mutations. 2+2+1