



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 4th Semester Examination, 2020

MCBACOR08T-MICROBIOLOGY (CC8)

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words as far as practicable.*

Question no.1 is compulsory. Answer any four questions from the rest

1. Answer any **four** questions from the following: 2×4 = 8
 - (a) Distinguish between Transversion and Transition mutation.
 - (b) Comment on the differences in genome of transducing particles generated in generalized and specialized transductions.
 - (c) Why are $F^+ \times F^+$ mating incompatible?
 - (d) Define conditional mutation with example.
 - (e) Define stringent and relaxed plasmids.
 - (f) What are IS elements?
 - (g) How is a merozygote formed?
 - (h) What are Par functions of plasmid?

2. (a) How the copy number of ColE1 derived plasmid is maintained in a bacterial cell? 2½
 - (b) In a P1 transduction experiment, the P1 lysate contains phages that carry pieces of host chromosomal DNA, but the lysate also contains broken pieces of chromosomal DNA. If a P1 lysate is used to transfer chromosomal DNA to another bacterium, how would you show experimentally that the recombinant bacterium has been transduced (i.e. taken up P1 phage with a piece of chromosomal DNA inside) versus transformed (i.e. taken up a piece of chromosomal DNA that is not within the P1 phage coat)? 2½
 - (c) Explain how does the mismatch repair system discriminate between parent strand and daughter strand. 3

3. (a) What do you mean by zygote induction? 2
 - (b) What are inverted repeats? Why are they common in most of the bacterial transposons? 1+2
 - (c) What is positive selection of mutants? 2
 - (d) If a plasmid is mobilizable but non conjugative, what function does it lack? 1

4. (a) What is the difference between mutation rate and mutation frequency? 3
 - (b) Double auxotrophs of two *E.coli* strains with different markers when mixed together was found to give prototrophic colonies but when the culture of one strain was mixed with the culture supernatant of another culture, no colonies observed. Explain. 2
 - (c) Competence generation in *Bacillus subtilis* is regulated by a two component regulatory system — Explain. 3

5. (a) What could be the fates of a foreign DNA molecule if it enters a bacterial cell? 2
 (b) What are the different transducing particles that could be formed after induction of a lambda phage from *E.coli* lysogen? 3
 (c) How does transposition of Tn3 occur? 3
6. (a) UV light causes thymine dimerization. Describe the mechanisms in order of efficiency that can repair the damage. Mention the enzymes involved. 3
 (b) What are the differences and similarities between Intergenic and Intragenic Suppression? 3
 (c) What effect would a loss of function mutation in *lexA* have on *E.coli*? 2
7. (a) Show what type of mutation would you expect each of the following mutagens to cause? 2+2+2
 (i) Nitrous acid (ii) 5-Bromouracil (iii) Proflavin
 (b) If in a particular cell type, Rifampicin were to inhibit DNA transfer, what would you conclude about the transfer mechanism? 2
8. (a) Donor DNA from bacteria of genotype $a^+b^+c^+$ was used to transform mutant bacteria carrying the linked genes $a^-b^-c^-$. The distribution of transformants are as follows: 3

$a^+b^+c^+$	1400
$a^+b^-c^-$	350
$a^+b^+c^-$	150
$a^-b^+c^-$	60
$a^-b^+c^+$	300
$a^-b^-c^+$	100
$a^+b^-c^+$	10

Construct a linkage map showing order of genes and the distances between the adjacent genes.

- (b) Describe with diagram the coupling model of regulation of iteron plasmids. 3
 (c) What is meant by conditional lethal mutation? 2
9. (a) Prove that single stranded DNA uptake takes place by transformation. 3
 (b) How reactive oxygen species cause mutations? 2
 (c) If leu^+str^r recombinants are desired from the cross $Hfrleu^+str^s \times F^+leu^-str^r$, on what medium should the mating pairs be plated? Which are selected and counter selected marker? 2
 (d) If two plasmids cannot be maintained in a single cell, what property is common to them? 1

N.B. : Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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