Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Sc.(H)/MICRO.BIO./BT/MOL.BIO./GENETICS/SEM-3/MCG-301/2012-13

2012

MICROBIAL GENETICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) Which of the following can be used as a tool by microbial genetics ?

a) Plasmids

b) Bacteriophage

c) Transposable elements

d) All of these.

ii) Interrupted mating experiments are used to determine what information ?

a) DNA nucleotide sequences

b) Levels of DNA homology

c) Bacterial genome maps

d) DNA is transferred from F^- to F^+ cells.

iii) The relationship between a virus and host where no new viral particles are produced and the viral genome is replicated along with host chromosome is

a) lysogeny b) lytic

c) transformation d) insertion element.

iv) A bacterial cell that is able to take up naked DNA is said to be

a) competent b) liable

c) infected d) integron.

v) Which of the following are true in regard to $F^+ \times F^-$ mating events ?

a) DNA is transferred from F^+ to F^- cells

b) DNA is transferred from F^- to F^+ cells

c) No DNA is transferred because F^- cells are unable to perform conjugation

d) The F^+ cell is converted to an F^- cell.

vi) The transfer of genetic material between bacteria in direct physical contact is called

a) conjugation b) transformation

c) transduction d) none of these.

vii) The most common form of gene expression regulation in both bacteria and eukaryotes is

a) translational control

b) transcriptional control

c) post-transcriptional control

d) post-translational control.

viii) When tryptophan is present in the environment of *E.coli*, the tryptophan binds to the

a) trp operon b) trp promoter

c) trp operator d) trp repressor.

ix) A lysogen of *E.coli* becomes resistant to further infection by bacteriophage λ because

a) *E.coli* no longer contains receptors on its cell surface

b) *E.coli* cell is dead

c) *E.coli* contains λ repressor in its cell

d) one copy phage is already present inside the cell.

x) The phenomenon of artificial transformation was first demonstrated by

a) Mandel & Hige in the year 1970

b) Mandel & Hige in the year 1930

c) Griffith in the year 1928

d) Avery, MacLeod and MacCarty in the year 1928.

xi) 'Transforming principle' is nothing but the

a) DNA b) RNA

c) Protein d) Lipid.

xii) Bacteriophage capable of productively infecting a cell is called

a) Infection b) Plaque forming unit

c) Lysis d) Lysogenesis.

xiii) ..... pumps lactose inside the cell.

a) β-Galactosidase

b) Glucose

c) Galactose

d) β-Galactosidase Permease.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Describe the roles of $CaCl_2$ and Heat Shock in artificial transformation. 2½ + 2½

3. Write short notes on BAD operon.

4. Describe the differences between Generalized and Specialized transductions.

5. Briefly explain the DNA replication during the lambda lytic pathway.

6. Describe the role of mob and bom gene in plasmid transfer.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Briefly explain the lysogenic life cycle of bacteriophage.

   b) Which factors are responsible to decide between lysis and lysogeny ?

c) Distinguish between *E.coli* phage T4 and *E.coli* phage T7. 5 + 5 + 5

8. Write down the structures of insertion sequence. What are the differences between composite and non-composite transposons ? Write short note on integron. Describe the replicative transposition with proper diagram. 2 + 3 + 5 + 5

9. Why in presence of both glucose and lactose, is lac operon not fully active ? State with proper explanation whether β - galactosidase (lac Z) will be synthesized (a) in presence of and (b) in absence of lactose in the medium for the following genotypes :

i) I + P + O + Z +

ii) I + P + Oc Z +

iii) I – P + Oc Z +

iv) I + P + Oc Z –

v) I – P + O + Z + 5 + 10

10. What is the utility of having two trp codons in the leader polypeptide of trp-operon ? What is the basic difference between the repression system of ara and trp operon ? How trp operon is regulated by overall availability of tryptophan in the medium ? 4 + 4 + 7

11. a) What are Hfr bacteria ? Differentiate F^+ and Hfr bacteria. Why in the conjugation of Hfr with F^-, Hfr cannot make F^- to F^+ ?

    b) What is plasmid incompatibility ?

    c) Define recon, cistron and muton.

(2 + 3 + 3½) + 2 + 4½

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