Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Sc.(H)(BT/GE/MICRO/MOL)/SEM-3/MCG-301/2011-12

2011

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 × 1 = 10

i) During replication which one of the following enzymes unwinds the DNA double helix ?

a) DNA pol I

b) Single stranded binding protein

c) DnaB protein

d) DnaA protein.

ii) IPTG is an example of

a) a repressor

b) a gratuitious inducer

c) an inducer

d) an attenuator.

iii) Colicin E2

a) damages cytoplasmic membrane

b) degrades DNA

c) cleaves 16S *r* RNA

d) none of these.

iv) A piece of DNA that can be moved and integrated into different sites in the chromosome is

a) Integron b) R plasmid

c) Trensposon d) none of these.

v) Nature of repressor molecule is a

a) carbohydrate b) nucleoprotein

c) glycolipid d) protein.

vi) CAP-cAMP participates in

a) postitive regulation

b) negative regulation

c) both (a) and (b)

d) none of these.

vii) The size of phage T4 DNA is

a) 150 kb b) 166 kb

c) 170 kb d) 180 kb.

viii) B sliding clamp is the processivity subunit of

a) DNA polymerase I b) DNA polymerase II

c) DNA polymerase III d) DNA ligase.

ix) Which of the following is true in regards to F_- – x Hfr mating events ?

a) F – becomes F+

b) F – remains F–

c) DNA transferred from F – to F+

d) none of these.

x) The nature of plaque formed by T4*r* + phage is

a) the plaques are small with fuzzy edge

b) the plaques are large with sharp edge

c) both (a) and (b)

d) none of these.

xi) Sigma mode of replication is found in

a) *E coli* b) T4 phage

c) λ phage d) phi x 174 phage.

xii) Minimum genome size for a living organism is

a) 10 mbp b) 0·6 mbp

c) 0·7 mbp d) 2 mbp.

GROUP – B

(Short Answer Type Questions)

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

2. Describe the methods of artificial transformation with reference to calcium chloride mediated transformation and electroporation. $2\frac{1}{2} + 2\frac{1}{2}$

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

4. What is repression loop ? What is the significance of repression loop in ara operon ? 2 + 3

5. What is one step growth curve ? Describe the phases of one step growth curve. Explain specificity in phage infection with reference to *Tsx* ^{r} and *h* mutant. 1 + 2 + 2

6. a) What is meant by supercoiling of DNA ?

   b) Describe the regulation of *trp* operon briefly.

   c) Comment on Plasmid Copy Number briefly. 1 + 2 + 2

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. With respect to chromosome partitioning, describe the function of the following : 6 + 3 + 2 + 4

   a) Par proteins b) Muk proteins

   c) Ftz proteins d) Min proteins.

8. What is high frequency transducing lysate ? Differentiate between Gram positive and Gram negative transformations. Write a note on specialized transduction with a suitable diagram. 2 + 7 + 6

9. How can you prove bacterial conjugation requires the participating cell to come in contact with each other ? What are F– and Hfr cells ? What happens after the mating of F– and Hfr cells ? The order of four genes in an Hfr strain is *a*–*b*–*c*–*d*. In a cross between an Hfr donor that has a genotype *a*+ *b*+ *c*+ *d*+ *x*+ str–*s* and a female that has a genotype of *a*– *b*– *c*– *d*– *x*+ str–*r*, 90% of the *d*+ str–*r* recombinants are *x*–, and 100% of the *c*+ and *d*+ str–*r* recombinants are *x*–. The times of entry of *a*, *b*, *c* and *d* are 5,10,15 and 20 minutes; the str–*r* gene enters at 55 minutes. Where is *x* located ? 3 + 4 + 4 + 4

10. How attenuation and anti-termination is brought about in a *trp* operon ? Describe the global regulation of lac operon. $7\frac{1}{2} + 7\frac{1}{2}$

11. Which proteins are responsible for the decision between the lytic and lysogenic cycles in lamda phage ? Differentiate between lytic and lysogenic cycles of a phage. How phage mutants are isolated ? What is meant by immunity to infection ? 3 + 6 + 4 + 2