



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.

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[ Turn over



- ii) IPTG is an example of
- a) a repressor
  - b) a gratuitous 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) Transposon
  - d) none of these.



v) Nature of repressor molecule is a

- a) carbohydrate                      b) nucleoprotein
- c) glycolipid                          d) protein.

vi) CAP-cAMP participates in

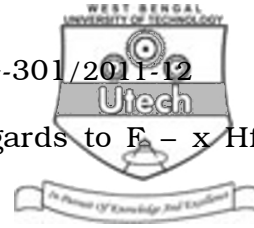
- a) postitive regulation
- b) negative regulation
- c) both (a) and (b)
- d) none of these.

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  $F^- \times Hfr$  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  $T4r^+$  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)  $\lambda$  phage
- d)  $\phi \times 174$  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 × 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

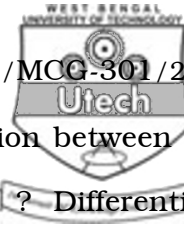


**GROUP – C**

**( Long Answer Type Questions )**

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

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<sup>-</sup> and Hfr cells ? What happens after the mating of F<sup>-</sup> 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

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