Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Winter Examination-2018

Subject Name: Microbial Genetics & Molecular Microbiology

Subject Code: 5SC03MIG1 **Branch: M.Sc. (Microbiology)**

Semester: 3 **Date: 27/11/2018** **Time: 02:30 To 05:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator and any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

SECTION – I

Q-1 **Attempt the Following questions** **(07)**

a. Name the three scientists who rediscovered Mendel's laws in 1900.
b. Define gene
c. Name the stage of cell cycle at which crossing over occurs?
d. The scientific name of garden pea is…….
e. Define linkage
f. What is nonsense mutation
g. Name any two intercalating agents

Q-2 **Attempt all questions** **(14)**

a) In Drosophila, gray body color is dominant to ebony body color, while long wings are dominant to vestigial wings. Assuming that the P_1 individuals are homozygous, work the following crosses through the F_2 generation, and determine the genotypic and phenotypic ratios for F_2 generation:- **(7)**
(a) gray, long **X** ebony, vestigial
(b) gray, vestigial **X** ebony, long
(c) gray, long **X** gray, vestigial

b) Comment on direct repair mechanism for DNA. **(4)**

c) Describe chiasmata formation **(3)**

OR

Q-2 **Attempt all questions** **(14)**

a) Explain how CDK activity is modulated by the following proteins: (a) cyclin, (b) CAK, (c) Wee1. **(7)**

b) Leeland Hartwell, a recipient of the 2001 Nobel Prize, was acknowledged for his characterization of cell cycle checkpoints in the budding yeast S. cerevisiae. What is a cell cycle checkpoint? Where do checkpoints occur in the cell cycle? **(4)**

c) Write a note on telophase and cytokinesis **(3)**

Q-3 **Attempt all questions** **(14)**

a) What are base analogs? How they may lead to a mutation? **(7)**

b) Define the term mutation. What is the difference between a transition and a transversion? Which type of base substitution is usually more common? **(4)**

c) Explain why Mendel choose garden pea in his experiments? **(3)**

OR

Q-3 **a)** Explain MMR and NER mechanisms of DNA repair with the help of diagram **(7)**

b) Compare incomplete dominance and co-dominance **(4)**

c) Give role of DNA glycolyses & AP endonuclease in base excision repair. **(3)**

SECTION – II

Q-4 **Attempt the Following questions** **(07)**

a. What is the role of allolactose in lac operon

b. Define plaque

c. Define lysogeny

d. Define prophage

e. What is Promoter?

f. Expand LINEs

g. Expand IPTG

Q-5 **Attempt all questions** **(14)**

a) Describe the role of attenuation in the regulation of tryptophan biosynthesis. **(7)**

b) Describe the origin of F' bacteria and merozygotes **(4)**

c) What is the role of three enzyme involved in Lac-operon **(3)**

OR

Q-5 **a)** Explain conjugation between Hfr and F⁻cell with the help of a labeled diagram. **(7)**

b) In a genetic screen, researchers isolated mutants of E. coli that constitutively expressed the genes from the araBAD operon. Describe what constitutive expression means in terms of the araBAD operon. **(4)**

c) Explain hybrid dysgensis in Drosophila **(3)**

Q-6 **a)** **Attempt all questions** **(14)**

b) Compare Generalized transduction and specialized transduction **(7)**

Waxy endosperm (wx), shrunken endosperm (sh), and yellow seedling (v) are encoded by three recessive genes in corn that are linked on chromosome 5. A corn plant homozygous for all three recessive alleles is crossed with a plant homozygous for all the dominant alleles. The resulting F_1 are then crossed with a plant homozygous for the recessive alleles in a three-point testcross. The progeny of the testcross are: **(7)**

wx	sh	V	87
Wx	Sh	v	94
Wx	Sh	V	3479
wx	sh	v	3478
Wx	sh	V	1515
wx	Sh	v	1531
wx	Sh	V	292
Wx	sh	v	280
Total			10,756

a) Determine the order of these genes on the chromosome.
b) Calculate the map distances between the genes.
c) Determine the coefficient of coincidence and the interference among these genes.

OR

Q-6 **Attempt all Questions**

a) A series of Hfr strains that have genotype:- $m^+ n^+ o^+ p^+ q^+ r^+$ are mixed with an F^{--} strain that has genotype $m^- n^- o^- p^- q^- r^-$. Conjugation is interrupted at regular intervals and the order of the appearance of genes from the Hfr strain is determined in the recipient cells. The order of gene transfer for each Hfr strain is: **(7)**

Hfr5	m+	q+	p+	n+	r+	o+
Hfr4	n+	r+	o+	m+	q+	p+
Hfr1	o+	m+	q+	p+	n+	r
Hfr9	q+	m+	o+	r+	n+	p

What is the order of genes on the circular bacterial chromosome? For each Hfr strain, give the location of the F factor in the chromosome and its polarity.

b) Explain the role of following genes/ gene products in lytic- lysogenic switching in λ phage: **(4)**
i) Cro
ii) N
iii) int
iv) xis

c) Explain cyclic permutation and terminal redundancy in T-even phage. Also state the importance of 5HMC in place of Cytosine in T-even phage genome. **(3)**