BITS PILANI, DUBAI CAMPUS
FIRST SEMESTER 2012-2013
Comprehensive Exam
Date: 31.12.2012

Course Title: Genetics **Course NO: BIOT C332/ F243**
Maximum Marks: 40 **Weightage : 40%** **Duration: 3 hours**

Attempt all the questions in the given sequence

Q1a. Describe the events that occur during the V-J joining. [3]
b. Explain the role of nitrous acid in DNA mutations. [2]
c. Discuss the role of *cIII* protein in the lambda phage repressor transcription. [2]
d. What are the different subunits of RNA polymerase II. Describe the role of each in transcription.[3]

Q2a. Explain the Dideoxy method of DNA sequencing. Emphasize with a neat diagram [3]
b. Explain J Crain's experiment to verify the semiconservative method of DNA replication. Also mention his interpretations. [2]
c. Estimate the amount of energy spent in making a 10 amino acid peptide. [2]
d. DNA from a bacterial strain that is $a^+ b^+ c^+$ is used to transform a strain that is $a^- b^- c^-$.The numbers of each transformed genotype appear. What can we say about the relative position of the genes? [3]

Genotype	Numbers
$a^+ b^- c^-$	214
$a^- b^+ c^-$	231
$a^- b^- c^+$	206
$a^+ b^+ c^-$	11
$a^+ b^+ c^+$	6
$a^+ b^- c^+$	93
$a^- b^+ c^+$	14

Q3a. Explain the terms: i. consensus sequence; ii. Conservative transposons; iii. electroporation; iv. coefficient of coincidence [2]
b. Two agouti mice are crossed, and over a period of a year they produce 48 offspring with the following phenotypes: 28 agouti mice 7 black mice 13 albino mice
What is your hypothesis about the genetic control of coat color in these mice? Do the data support that hypothesis? ($p < 5.991$ at 2,0.05) [2]
c. Why is generalized transduction preferred over the specialized transduction for gene mapping? [2]
d. PKU and albinism are two autosomal recessive disorders, unlinked in human beings. If two people, each heterozygous for both traits, produce a child, what is the chance of their having a child with
i. PKU? ii. either PKU or albinism? iii. both traits? [2]
e. To clone a particular gene the scientists must have a purified ds piece of DNA containing that gene. Suggest two methods of obtaining these ds DNA. [2]

Q4a. Explain the maternal inheritance of coiling in snails. Emphasize with a neat diagram. [3]
b. Name the two classes of proteins involved in chromatin remodeling. [2]
c. Within a population of butterflies, the color brown(B) is dominant over the color white, and 40% of all butterflies are white. Given this information, calculate the following. [2]
i. The percentage of butterflies in the population that are heterozygous
ii. The frequency of homozygous dominant individuals.
d. In garden peas, long stems are dominant to short stems, and yellow seeds are dominant to green seeds. 100 long/yellow pea plants, all of which has one short/green parent, are interbred. 1600 progeny result. Please answer the following questions about the progeny. [3]
i. Assuming that these two genes are unlinked, about how many long/green pea plants would you expect to find among the offspring ?
ii. What would be the number of yellow seed colour pea plants among the offspring?
iii. What would be the number of short stem pea plants among the offspring?

**********ALL THE BEST**********

BITS PILANI, DUBAI CAMPUS
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FIRST SEMESTER 2012-2013
TEST – 2 (OPEN BOOK)

Course No.: BIOT C332/ BIOT F243 **18.11.12** **Maximum Marks: 20**
Course Title: Genetics **Maximum Time: 50 mins**

Only Prescribed Text Books and Hand Written notes are allowed.
Answer all the questions in the given sequence. Draw a neat diagram wherever necessary.

1. Suggest a method/s of DNA repair mechanism during replication, to reverse the damage caused due to exposure to UV light. [4]

2. In *Neurospora*, a cross is made between ab^+ and a^+b individuals. The following one hundred ordered tetrads are obtained:

Spores	I	II	III	IV	V	VI	VII	VIII
1,2	a^+b	a^+b	a^+b	a^+b^+	a^+b^+	a^+b	a^+b	ab^+
3,4	a^+b	a^+b^+	a^+b^+	a^+b	a^+b	ab^+	ab^+	a^+b
5,6	ab^+	ab	ab^+	ab	ab^+	a^+b	ab^+	a^+b
7,8	ab^+	ab^+	ab	ab^+	ab	ab^+	a^+b	ab^+
	79	3	4	3	3	3	3	2

a. are genes *a* and *b* linked? How do you understand? [2]
b. Calculate the gene-to-centromere distances for *a* and *b*. [4]

3. What is interrupted mating? How is it used in gene mapping? [2]

4. In a transformation experiment, a his^+ lue^+ trp^+ strain is used as a donor and an his^- leu^- trp^- strain as the recipient. Two hundred his^+ trasformants are selected and checked for lue^+ and trp^+. What can you conclude about the relative position o f the genes, based on the data provided? [3]

his^+ leu^- trp^-	44
his^+ lue^- trp^+	142
his^+ lue^+ trp^-	6
his^+ lue^+ trp^+	8

5. Give the significance of single and double crossover events in recombination. [2]

6a. Mention the different methods for joining two incompatible pieces of DNA. [1.5]

b. How can we manipulate a prokaryotic vector to survive in *Saccharomyces cerevisiae*? [1.5]

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BITS PILANI, DUBAI CAMPUS
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FIRST SEMESTER 2012-2013
TEST – I (CLOSED BOOK)

Course No.: BIOT C332/ BIOT F243 **30.09.12** **Maximum Marks: 25**
Course Title: Genetics **Maximum Time: 50 mins**

Answer all the questions in the given sequence. Draw a neat diagram wherever necessary.

1. Explain the Meselson and Stahl experiment. [4]
2. Explain the self splicing of introns in the eukaryotic RNA. [3]
3. The replication of the lagging strand of DNA is discontinuous. Justify. [3]
4. Write a short note on the Terminators of prokaryotic Transcription. [4]
5. What is the key role of the enzymes topoisomerase IV, DNA ligase, DNA polymerase I and Helicase? [2]
6. Diagrammatically explain the Hershey and chase experiment. [3]
7. Justify the differences between eukaryotic and prokaryotic transcription [3]
8. What are enhancer and silencer regions? Where are they located? [3]

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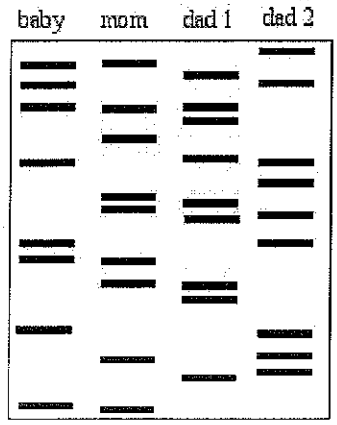
1st Semester 2012- 2013

Genetics BIOT C332/ BIOT F243 **Quiz – 2 (Close book)**

Date: 18/12/12 (Tu) Duration: 20 minutes Weightage: 7% (Max Marks 7)

Id No: _____ Name: _____

1. Who is the daddy? This mother is trying to decide between two men who desperately wants to support her and her newborn baby. Both want to be a part of the baby's life, because they love the mother so much. Who gets the honor and privilege? [1]



2. Explain catabolite repression in *lac* operon. [2]

3. Give the significance of the leader transcript in *trp* operon. [1]

4. _____ and _____ are the two antiterminators for lytic cycle. [1]

5. Describe the event that follow after a lambda lysogen is exposed to UV light. [1]

6. With the help of a neat labeled diagram show the duplication of target site due to transposition. [1]

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1st Semester 2012- 2013

Genetics BIOT C332/ BIOT F243 **Quiz – 1 (Close book)**

Date: 18/10/12 (Th) Duration: 20 minutes Weightage: 8% (Max Marks 8)

Id No: _____ **Name:** _____

1. What is the scanning hypothesis? [1]

2. What is molecular mimicry? [1]

3. Luria and Delburck studied the _____ mutants of *E.coli* strain to study the _____test. [1]

4. What is a cistron? [1]

5. Point mutations could be lethal in some cases, while could go unnoticed in some. Justify. [2]

6. Explain the mechanism of transversion mutations. [2]