

BITS, Pilani- Dubai
Dubai International Academic City
First Semester 2009- 2010

Comprehensive Exam (Closed book)

Course No. : BIOT C332
Course Title: Genetics

Maximum Marks: 40
Duration: 3 hours

Date: 24.12.2009

Attempt all the questions in the given sequence

Q1. Albinism is recessive trait. If two persons, heterozygous for albinism have five children, what is the probability that

- a. All five children are albino. [1M]
- b. All five children are albino sons. [2M]
- c. Two are albino sons and three are albino daughters. [2M]

Q2. Two curly winged flies, when mated, produced sixty one curly and thirty five straight winged progeny. Use a chi square test to determine whether these numbers fit a 3:1 ratio. (With one degree of freedom and $p > 0.05$, critical chi square = 3.841) [5M]

Q3.a. Explain briefly the Dideoxy method of DNA sequencing. [3M]
b. What are split genes? [2M]

Q4.a. Explain the cytoplasmic inheritance in *Chlamydomonas*. [3M]
b. What is the significance of V-J joining in antibody diversity? [2M]

Q5.a. Give the three rules of Hardy-Weinberg. [3M]
b. How is DNA created from RNA. [2M]

Q6.a. Diagrammatically explain the Holliday model of recombination. [3M]
b. What is zygotic induction? [2M]

Q7.a. Explain the two major differences between Prokaryotic and eukaryotic transcription. [3M]
b. A double stranded DNA molecule is 30% guanosine (G). What is the complete base composition of this molecule? [2M]

Q8.a. Why does misalignment result in addition or deletion of bases? [2M]
b. State the Mendel's rule of independent assortment. [1M]
c. How does interrupted mating help in gene mapping? [2M]

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Test 2 (Open book)

Course No. : BIOT C332
Course Title: Genetics

Maximum Marks: 20
Duration: 50 Mins

Date: 06.12.2009

Attempt all the questions in the given sequence

Q1. *Lac* operon is said to be under negative as well as positive regulation. Justify.
[4 marks]

Q2. How does the *trp* operon react to the shortage of phenylalanine and glutamic acid in the *E.coli* cell? [2marks]

Q3. A temperature sensitive mutant of the λ *cI* gene has been isolated. At 30°C the *cI* repressor binds λ DNA, but cannot bind DNA at 42°C. What is the consequence of incubating *E.coli* that are lysogenic for this mutant at 42°C? Explain. [3marks]

Q4. Transposons are flanked by direct repeats. Justify. [3marks]

Q5. Information derived from a two point crossover is insufficient for gene mapping. Justify. [3marks]

Q6. In *E.coli*, the three loci *lac*, *ala* and *bio* are within 1-2 minute map distance apart. To determine the exact order and relative distance, the prototroph (*lac*⁺ *ala*⁺ *bio*⁺) was infected with a transducing phage P1. the lysate was used to infect the auxotroph (*lac*⁻ *ala*⁻ *bio*⁻). The *lac*⁺ classes of transductants were selected to produce the following data:

<i>lac</i> ⁺	<i>lac</i> ⁺	<i>lac</i> ⁺	<i>lac</i> ⁺
<i>ala</i> ⁻	<i>ala</i> ⁺	<i>ala</i> ⁻	<i>ala</i> ⁺
<i>bio</i> ⁻	<i>bio</i> ⁻	<i>bio</i> ⁺	<i>bio</i> ⁺
122	78	0	300

- Mention the technique used to screen the different classes of transductants. [1mark]
- What is the gene order and why? [2 mark]
- What are the relative cotransduction frequencies between the genes? [2mark]

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FIRST SEMESTER 2009-2010
TEST – I (CLOSED BOOK)

COURSE NO.: BIOT C332

11.10.09

MAXIMUM MARKS: 25

COURSE TITLE: GENETICS

DURATION: 50 Minutes

- **Answer to the point**
 - **Answer all questions in the given sequence**
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Q1. A man has blood type A and his wife has type B. A physician types the blood of their four children and is amazed to find one of each of the four blood types among them. He is not familiar with genetics and calls upon you for an explanation. Provide one. [2 Marks]

Q2. An albino man marries a normally-pigmented woman who had an albino mother. Show the types of children that this couple may have and the proportions of each. (Albino is recessive; normal is dominant). [3 Marks]

Q3. Give a comparison between the alternative forms of DNA in a tabular form. [3 marks]

Q4. List the enzymes and their subunits involved in prokaryotic DNA replication and give their role in brief. [5 marks]

Q5. Give the significance of Ori C and Ter sites in DNA replication and caps and tails in eukaryotic transcription. [4 marks]

Q6. Schematically explain the rolling circle model of DNA replication. [3 marks]

Q7. Mention the steps involved in prokaryotic transcription. [2 marks]

Q8. Give examples of any two unusual bases found in tRNA. [1 marks]

Q9. Give the significance of Pribnow box. [2 marks]

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Quiz 2 (closed book)

Course: Genetics BIOT C332

Date: 11.11.2009

Time 12.05pm – 12.30 pm

Weightage: 7%

Q1. What are AP sites? [1M]

Q2. What are the two major properties of Rec A protein? [2M]

Q3. What types of damage do excision repair endonuclease recognize?
[2M]

Q4. In conjugation experiments, one Hfr strain should carry a gene for some sort of sensitivity (eg. *Azi^r* or *str^r*) so that the Hfr donors can be eliminated on selective media, after conjugation has taken place. Should this locus be near to or far from the origin of transfer point of the Hfr chromosome. [1M]

Q5. A mating between *his⁺, leu⁺, thr⁺, pro⁺, str^r* cells (Hfr) and *his⁻, leu⁻, thr⁻, pro⁻, str^r* cells (F^-) is allowed to continue for 25 minutes. The mating is stopped and the genotypes of the recombinants are determined. What is the probable gene order, based on the following data? [1 M]

Genotype	Number of colonies
<i>his⁺</i>	0
<i>leu⁺</i>	12
<i>thr⁺</i>	27
<i>pro⁺</i>	06

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Quiz 1 (closed book)

Course: Genetics BIOT C332

Date: 22.10.2009 Time 7.45am – 8.05 am

- Q1. Name the enzyme that joins the specific amino acid to its tRNA. [1 mark]
- Q2. How many GTPs are hydrolyzed during translation? [1 mark]
- Q3. Give the Shine Delgarno sequence. [1 mark]
- Q4. What is the meaning of the term 'polycistronic'. [1 mark]
- Q5. Give the significance of the fluctuation test. [1 mark]
- Q6. Define mutation rate. [1 mark]
- Q7. Give one example of a chemical mutagen that causes transversions in the DNA. [1 mark]
- Q8. What are frame shift mutations? [1 mark]