國立成功大學

112學年度碩士班招生考試試題

編　號：57

系　所：生命科學系

科　目：分子生物學

日　期：0207

節　次：第 3 節

備　註：不可使用計算機

編號： 57

國立成功大學 112 學年度碩士班招生考試試題

系　　所：生命科學系

考試科目：分子生物學

考試日期：0207，節次：3

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Briefly explain the terms below (4 points x 4)

a. Cell cycle checkpoints

b. Semiconservative model (DNA replication)

c. Kinetochore

d. Transposon

2. A homozygous tomato plant with red fruit and yellow flowers was crossed with a homozygous tomato plant with golden fruit and white flowers. The F_1 all had red fruit and yellow flowers. The F_1 were testcrossed by crossing them to homozygous recessive individuals, and the following offspring were obtained:

Red fruit and yellow flowers—51

Red fruit and white flowers—14

Golden fruit and yellow flowers—10

Golden fruit and white flowers—45

a. How many map units separate these genes? Answer it with the calculation process. (5 points)

b. What is "genetic recombination"? Explain it using the following words: nonparental phenotype(s), crossing over, synapsis. (5 points)

3. In Eukaryotic cells, DNA molecules are compactly packaged in the nucleus. Using the following terms, explain the DNA packaging: chromosome, chromatin, nucleosome, histone. (8 points)

4.You want to distinguish the genotype of the mutant from that of the wild type, without directly checking the sequences with a DNA sequencing machine.

a. The sequences of the wild type and the mutant A are as follows. The mutation A is a single nucleotide exchange (C to T). How do you detect the nucleotide difference between them? Explain how to do, using the words; PCR, Restriction enzyme. (8 points)

Wild Type: 5'-・・・GATATCTGGATCAGAACAAAGCTTTTACTTGCTTAGCATATTGTGCAGACGGAAACCTTTT・・・-3'

Mutant A: T

b. The sequences of the wild type and the mutant B are as follows. The mutation B is a single nucleotide exchange (C to T). How do you detect the nucleotide difference between them? (8 points)

Wild Type: 5'-・・・TGCCAATACCCCGTTAGGTAGCTTTTACGCCTAAGCTTTAGGAAACCGAAATTTTCAACCCT・・・-3'

Mutant B: T

國立成功大學 112 學年度碩士班招生考試試題

系　　所：生命科學系

考試科目：分子生物學

考試日期：0207，節次：3

5. If the 5' splice site sequence changed from 5'-GUA**A**GU-3' to 5' -GUA**U**GU-3', predict the effect of the sequence change on U1 binding and U6 snRNP binding in an in vitro protein-RNA binding assay. (10 points)

6. Compare and contrast the features of prokaryotic mRNA to a eukaryotic mRNA. (10 points)

7. The most common level of regulation of gene expression occurs at transcription initiation. Explain why. (10 points)

8. Generally describe three mechanisms for how short RNAs in eukaryotes (siRNAs, miRNAs, and piRNAs) silence expression. (10 points)

9. Please describe the transcription termination models in bacteria. (10 points)