國立成功大學

112學年度碩士班招生考試試題

編　號：63

系　所：熱帶植物與微生物科學研究所

科　目：分子生物學

日　期：0207

節　次：第 1 節

備　註：不可使用計算機

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※ 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。

一、單選題（共 30 分，每題 3 分）

1. Functional DNA is *not* found in:

A) bacterial nucleoids.
B) chloroplasts.
C) lysosomes.
D) mitochondria.
E) nuclei.

2. The DNA in a eukaryotic chromosome is best described as:

A) a single circular double-helical molecule.
B) a single linear double-helical molecule.
C) a single linear single-stranded molecule.
D) multiple linear double-helical molecules.
E) multiple linear single-stranded molecules.

3. A convenient cloning vector with which to introduce foreign DNA into *E. coli* is a/an:

A) *E. coli* chromosome.
B) messenger RNA.
C) plasmid.
D) yeast "ARS" sequence.
E) yeast transposable element.

4. The PCR reaction mixture does *not* include:

A) all four deoxynucleoside triphosphates.
B) DNA containing the sequence to be amplified.
C) DNA ligase.
D) heat-stable DNA polymerase.
E) oligonucleotide primer(s).

5. Which is not the third-generation sequencing technology?

A) PacBio sequencing technology
B) Oxford Nanopore sequencing technology
C) Illumina sequencing technology
D) Quantapore sequencing technology
E) Stratos sequencing technology

6. The fundamental repeating unit of organization in a eukaryotic chromosome is:

A) the centrosome.
B) the lysosome.
C) the microsome.
D) the nucleosome.
E) the polysome.

7. Which of the following plants has the smallest genome size?

A) Arabidopsis
B) Alder
C) Maize.
D) Rice.
E) Sorghum

8. In the following two DNA fragments, the Tm value of "CCTTGCCGTAGCTCCTG" is higher than "AGAGAATCATGAAGCTA, which of the following statements is the reason causes the difference?

A) the energy for base pairing between G and C is higher than A and T
B) the energy to melt cytosine is much higher than the other three nucleotides, so the number of cytosine matters
C) the characteristics of initial and terminal nucleotides in the fragment are the determinant for Tm value
D) the energy to melt thymine is much higher than the other three nucleotides, so the number of thymine matters
E) all the above are incorrect

9. Which of the following statements about protein targeting to organelles is correct?

A) Protein targeting to ER is a post-translational translocation
B) Protein targeting to chloroplast is a co-translational translocation
C) Protein targeting to mitochondria is a post-translational translocation
D) Protein targeting to peroxisome is a co-translational translocation
E) all the above are correct

10. Which of the following structures is the attachment point for chromosome and spindle microtubules during mitosis?

A) telomere
B) centromere

C) 3'UTR
D) intron
E) exon

二、解釋名詞（共 30 分，每題 6 分）

1. Dominant negative mutation
2. Epigenetics
3. Enhancer
4. Reverse transcriptase
5. T-DNA (transfer DNA)

三、問答題（共 40 分）

1. Describe the "RNA world" hypothesis. (10 分)

2. What is satellite DNA? (10分)

3. During the past three years, COVID-19 pandemic has changed our lives in many aspects. Several COVID-19 vaccines have been developed to trigger our immune responses to defend against SARS-CoV-2. In Taiwan, five vaccines are available. They are AstraZeneca, Moderna, Pfizer-BioNTech (BNT), Medigen (高端) and Novavax. The principles of production of all these five vaccines are related to the central dogma of molecular biology. Please describe (1) the central dogma of molecular biology, and (2) the correlation of these five vaccines to the central dogma of molecular biology. (20分)