

國立成功大學

113學年度碩士班招生考試試題

編 號： 61

系 所： 生物科技與產業科學系

科 目： 分子生物學

日 期： 0202

節 次： 第 2 節

備 註： 不可使用計算機

※ 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。

選擇題 (20 題, 共 40 分): Select single answer from these questions (2 points each)

1. The wobble hypothesis states that :

- a. 5' base on the anticodon and the 3' base of a codon on mRNA can have non-standard base pairing
- b. Some mutations introduce termination codons
- c. An mRNA may encode more than one polypeptide
- d. Mutations are less likely to occur at the third base of the codon

2. Regarding the descriptions of the mutation, which of the following is not true ?

- a. Silent mutation is an alternation that changes a codon specific for one amino acid to another codon specific for the same amino acid
- b. Missense mutation is an alternation that changes a codon specific for one amino acid to a codon specific for another.
- c. Nonsense mutation is an alternation causing a change to a chain-termination codon.
- d. Suppression mutation is deletion or insertion of one or small number of base pairs that alter the reading frame.

3. Which of the following statements correctly describes the role of telomerase in eukaryotic cells?

- a. It synthesizes the Okazaki fragment needed to prevent loss of genetic information at the 5' end of the chromosome.
- b. It synthesizes new DNA (using a RNA template) at the 3' end of the chromosome.
- c. It synthesizes new DNA (using a DNA template) at the 3' end of the chromosome.
- d. It synthesizes DNA on both the 5' and 3' ends of the chromosome.

4. Why would the absence of DNA primers in PCR cause the reaction to fail?

- a. The reaction lacks template DNA when primers are absent.
- b. The reaction lacks a primer: template junction, and thus a free 3'-hydroxyl group, when primers are absent.
- c. The reaction lacks a free 2'-hydroxyl when primers are absent.
- d. The reaction lacks single-stranded DNA when primers are absent.

5. What are the functions of RecBCD in E. coli ?

- a. Facilitate homologous recombination by generating 3' single-stranded tails and helping assemble and load RecA proteins.
- b. Facilitate homologous recombination by generating 3' single-stranded tails and helping assemble and

load RecA proteins; destroy foreign DNA.

c. Facilitate homologous recombination by generating 5' single-stranded tails and helping assemble and load RecA proteins; destroy foreign DNA.

d. Facilitate homologous recombination by generating 5' single-stranded tails and helping assemble and load RecA proteins.

6. Which one is not in the core component of nucleosome?

a. H2A

b. H1

c. H4

d. H3

7. Which one of the following molecule functions as histone chaperons for nucleosome assembly?

a. Suv39

b. Rpd3

c. NuA3

d. CAF-1

8. Which part of chromosome shows relatively open structure

a. Telomere

b. Centromere

c. Euchromatin

d. Cohesion

9. Which of the following is a shared characteristic of miRNAs and siRNAs?

a. miRNAs and siRNAs are both processed in the nucleus by the protein Drosha

b. miRNAs and siRNAs are both processed in the nucleus by the protein Dicer.

c. miRNAs and siRNAs are both processed in the cytoplasm by the protein Dicer.

d. miRNAs and siRNAs are both made from large hairpin precursors.

10. Which protein is responsible for the ribosome recycling?

a. RF1

b. RRF

c. RF3

d. EF-Tu

- 11. It is more difficult to identify eukaryotic genes than prokaryotic genes because in eukaryotes ____.**
- a. the proteins are larger than in prokaryotes
 - b. there are introns
 - c. the coding portions of genes are shorter than in prokaryotes
 - d. there are no start codons
- 12. Which of the following statements accurately describes differences between DNA replication in prokaryotes and DNA replication in eukaryotes?**
- a. Prokaryotic chromosomes have histones, whereas eukaryotic chromosomes do not.
 - b. Prokaryotic chromosomes have a single origin of replication, whereas eukaryotic chromosomes have many.
 - c. The rate of elongation during DNA replication is slower in prokaryotes than in eukaryotes.
 - d. Prokaryotes produce Okazaki fragments during DNA replication, but eukaryotes do not.
- 13. What is the function of the enzyme topoisomerase in DNA replication?**
- a. relieving strain in the DNA ahead of the replication fork caused by the untwisting of the double helix
 - b. detecting the shape of the template base's surface to help recruit the appropriate nucleotide to pair
 - c. reattaching the hydrogen bonds between the base pairs in the double helix
 - d. building RNA primers using the parental DNA strand as a template
- 14. What is the role of DNA ligase in the elongation of the lagging strand during DNA replication?**
- a. It synthesizes RNA nucleotides to make a primer.
 - b. It joins Okazaki fragments together.
 - c. It unwinds the parental double helix.
 - d. It stabilizes the unwound parental DNA.
- 15. Base excision repair (BER) differs from nucleotide excision repair (NER) in which of the following ways?**
- a. BER recognizes helix distortions, while NER recognizes specific base damage.
 - b. NER recognizes helix distortions, while BER recognizes specific base damage.
 - c. BER involves a DNA synthesis step, while NER does not.
 - d. NER involves the removal and replacement of DNA containing altered bases, while BER does not.
- 16. Which of the following molecules binds with a repressor to alter its conformation and therefore affect its function?**
- a. inducer
 - b. promoter

c. transcription factor

d. cAMP

17. Which of the following environments would most likely lead to the transcription of the lactose operon?

a. There is more glucose in the cell than lactose.

b. The cyclic AMP levels are low.

c. There is glucose but no lactose in the cell.

d. The cyclic AMP and lactose levels are both high within the cell.

18. According to the lac operon model proposed by Jacob and Monod, what is predicted to occur if the operator is removed from the operon?

a. The lac operon would be transcribed continuously.

b. Only lacZ would be transcribed.

c. Only lacY would be transcribed.

d. Genes involved in glucose metabolism would not be transcribed.

19. Which of the following protein domains would be most likely to recognize and bind to acetylated lysine residues on nucleosomes?

a. homeodomains

b. zinc fingers

c. bromodomains

d. chromodomains

20. Which of the following describes how steroid hormones regulate gene expression?

a. They bind to control elements in a regulatory gene and promote synthesis of that operon.

b. They activate translation of certain mRNAs.

c. They promote the degradation of specific mRNAs.

d. They bind to intracellular receptors and alter transcription of specific genes.

簡答題 (10 題, 共 60 分)

1. Please describes how the 4E-BPs regulate the initiation of eukaryotic translation? (6%)
2. Please describe the functional role of CRISPR (6%)
3. Please describe the post-translational modification of histones (6 %)
4. Please explains the term "RISC" (6%)
5. What is a morphogen? (2 %) Please describe at least one molecule, which could be considered as the morphogen to regulate development. (4 %)
6. What is the problem with the telomeres replication? (4%) How to measure the lengths of telomeres (2%).
7. Please give two experimental tools (technologies) of how to investigate the protein-DNA binding. (6%)
8. Please describe the role of DNA methylation in gene expression in mammalian cells. (4%)
9. What is the function of chromatin remodeling complexes and histone chaperones in gene expression? (4%)
10. How does the bacteria tryptophan operon (Trp operon) regulate gene expression? (5%) How do the "Locus Control Regions" (LCRs) of eukaryotic globin genes regulate their expression? (5%)