

國立成功大學

113學年度碩士班招生考試試題

編 號：257

系 所：藥理學研究所

科 目：分子生物學

日 期：0202

節 次：第 3 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。

一、單選題 (54 分，每題 3 分)

請填寫答案至答案卷，題號標示清楚。

1. How many open reading frames can be possibly found in a double-stranded DNA ?
 - (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
 - (E) 5
 - (F) 6
2. Which of the following labeling nucleotide will be used to study transcription initiation ?
 - (A) α -labeled NTP
 - (B) β -labeled NTP
 - (C) γ -labeled NTP
3. Which of the following statements is TRUE ?
 - (A) All genes can be only transcribed once during a cell cycle.
 - (B) Genes can be overlapped and encode proteins with different amino acid sequences.
 - (C) RNA transcript can be used only once to translate a protein.
 - (D) Polyadenylation sequence can be found at the 3' of the gene sequence.
4. What is NOT TRUE descriptions for promoter and σ factor in *E. coli* ?
 - (A) Base substitution at -35 box will decrease promoter activity of *E. coli*.
 - (B) Base deletion or insertion between -35 box and -10 box will decrease the promoter activity.
 - (C) -10 box is the transcription start site for RNA transcript.
 - (D) The function of -10 box is similar to that of TATA box of eukaryotic RNAPII promoter.
5. Which eukaryotic RNA polymerase locates in nucleolus ?
 - (A) RNA polymerase I
 - (B) RNA polymerase II
 - (C) RNA polymerase III
6. Which eukaryotic RNA polymerase is most sensitive to α -amanitin ?
 - (A) RNA polymerase I
 - (B) RNA polymerase II

(C) RNA polymerase III

7. Which is the assembling factor of subunits in prokaryotic RNA polymerase ?

- (A) α
- (B) β
- (C) β'
- (D) σ

8. Which is the specificity factor of subunits in prokaryotic RNA polymerase ?

- (A) α
- (B) β
- (C) β'
- (D) σ

9. Which of the following motifs DO NOT contain DNA-binding activity ?

- (A) helix-turn-helix motif.
- (B) basic helix-loop-helix motif.
- (C) leucine zipper motif.
- (D) zinc finger motif.

10. Which of the following histone is NOT included in core histone?

- (A) H1
- (B) H2A
- (C) H2B
- (D) H3
- (E) H4

11. Which of the following is not true concerning eukaryotic mRNA processing?

- (A) addition of a 3' poly-A tail
- (B) addition of a 5' cap
- (C) intron splicing
- (D) occurs in the nucleus
- (E) occurs in the cytoplasm

12. The first two bases and the last two bases in the splicing signal consensus sequence are

- (A) GT-AG.
- (B) GU-AG.

- (C) CU-AG.
- (D) GU-AC.
- (E) GT-TG.

13. Which of the following is the name for the Yeast 40S particle where mRNA splicing takes place?

- (A) ribosome
- (B) nucleolus
- (C) spliceosome
- (D) hnRNA
- (E) R-loop

14. "Snurps" are composed of

- (A) RNA.
- (B) protein.
- (C) DNA.
- (D) RNA and protein.
- (E) DNA and RNA.

15. Which of the following snRNP is mismatched with its function?

- (A) U1: base pairs with 5' splice site of mRNA.
- (B) U2: base pairs with the conserved sequence at splicing branch point.
- (C) U4: base pairs with 3' splice site of mRNA.
- (D) U5: associates with last nucleotide in one exon and the first nucleotide in the next exon.
- (E) U6: base pairs with 5' end of the intron.

16. The catalytic center of the spliceosome appears to include

- (A) Mg²⁺.
- (B) U2 and U6 snRNP.
- (C) the branch point region of the intron.
- (D) Mg²⁺ and the branch point region of the intron.
- (E) Mg²⁺, U2, and U6 snRNP, and the branch point region of the intron.

17. Please put the following steps of Cap synthesis in the correct order.

- 1: N7 of the capping guanine is methylated.
- 2: The terminal phosphate is removed from the pre-mRNA.
- 3: A capping GMP is added to the pre-mRNA.
- 4: The 2'-O-methyl group of the penultimate nucleotide is methylated.

- (A) 1, 2, 3, 4
- (B) 1, 4, 3, 2
- (C) 2, 4, 1, 3
- (D) 2, 3, 1, 4
- (E) 4, 3, 2, 1

18. Which of the following is NOT a function of the mRNA Cap?

- (A) protects the mRNA from degradation
- (B) enhances translatability of the mRNA
- (C) enhances transport of the mRNA to the cytoplasm
- (D) enhances splicing of the mRNA
- (E) helps regulate expression of the mRNA

二、問答題：(46 分)

請填寫答案至答案卷，題號標示清楚。

1. Please describe **in detail** the essential components involved in protein synthesis and processes of protein translation in *E. coli*. (16%)
2. Please describe **in detail** the mechanism of DNA replication in *E. coli*. (10%)
3. Please describe the following biological terms.
 - (A) Nonsense mutation (4%)
 - (B) Okazaki fragment (4%)
 - (C) Rolling circle DNA replication (4%)
 - (D) Nucleotide excision repair (4%)
 - (E) Retrotransposons (4%)