

# 國立臺北科技大學九十八學年度碩士班招生考試

系所組別：3610 生物科技研究所甲組

## 第二節 分子生物學 試題

第一頁 共二頁

### 注意事項：

1. 本試題共三大題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

#### 一、選擇題（一小題 2%，共 40%）

##### 1. Spontaneous mutations

(A) cannot be repaired (B) can result from DNA replication errors. (C) can be caused by chemicals that damage DNA. (D) generally occur at a higher rate than that of induced mutations. (E) are more likely to be insertions than point mutations.

##### 2. The major difference between DNA and RNA is

(A) the number of phosphates carried by the nucleotide (B) the number of carbons in the sugar. (C) the presence of the base uracil in some DNA nucleotides. (D) the functional group on the 2' carbon of the sugar. (E) DNA has primarily pyrimidine bases.

##### 3. Initiation codon is a special codon used to start synthesis of a protein, which usually is

(A) AUG (B) UAG (C) UAA (D) UGA (E) UGG

##### 4. What sort of mutation can eliminate or reduces the activity of a gene. It is often, but not always, recessive. (A) null mutation (B) Leaky mutations (C) loss-of-function mutation (D) gain-of-function mutation (E) nonsense mutation

##### 5. In comparing homologous genes from different species, which statement is true?

(A) Intron sequences vary more than intron positions and exon sequences. (B) Exon sequences vary more than intron sequences. (C) Gene length variation can be attributed primarily to exon length variation. (D) Intron positions vary more than intron sequences. (E) Exon length varies more than intron length.

##### 6. The replication rate in eukaryotic cells is \_\_\_\_\_ as compared to the replication rate in prokaryotic cells. (A) slightly slower (B) slightly faster (C) much slower (D) much faster (E) about the same

7. About prokaryotic and eukaryotic genome replication, which of the following statements is true? (A) Bacterial replicons are usually circles that replicate unidirectionally from a single origin. (B) In eukaryotes, regional activation patterns suggest that replicons near one another are activated at the same time. (C) Both prokaryotic and eukaryotic genome DNA are linear form. (D) The origin of *E. coli*, *oriC*, is 50 bp in length. (E) All of the above.
8. Which of the following statements is describing about "corepressor"? (A) A DNA-binding protein that regulates the expression of one or more genes by inhibiting or decreasing the rate of transcription. (B) A DNA-binding protein that regulates one or more genes by increasing the rate of transcription. (C) Short DNA sequence that binds repressor protein and controls transcription of an adjacent gene (D) A small molecule that induces gene expression. (E) A protein that decreases gene expression by binding to a transcription factor which contains a DNA binding domain, but it is unable to bind DNA by itself.
9. Which of the following statements about RNAi is true? (A) Double-stranded RNA is introduced into cells to eliminate or reduce the activity of a target gene. (B) Silencing of a gene of interest. (C) It triggers degradation of mRNAs complementary to either strand of a short double-stranded RNA. (D) RNAi is generated when a dsRNA is cleaved into fragments that direct cleavage of the corresponding mRNA. (E) All of the above.
10. Which of the following is the regulator gene specific for the Lac operon? (A) *lacI* (B) *crp* (C) *lacZ* (D) *cya* (E) *lacA*
11. In a fully induced bacterial cell, when the inducer of the lac operon is used up, the level of lac mRNA (A) completely drops to no longer be present. (B) drops to a low basal level in the cell. (C) drops to a moderate level in the cell. (D) remains at the induced plateau level. (E) over to the induced level.
12. \_\_\_\_\_ functions as a regulator by forming a region of secondary structure (either inter- or intra-molecular) that changes the properties of a target sequence. (A) DNA (B) receptor (C) rRNA (D) RNA (E) tRNA
13. Replication generates \_\_\_\_\_, which cannot initiate replication. (A) hemimethylated DNA (B) hairpin structure (C) replicon (D) methylated DNA (E) attenuation
14. Repressor protein has two binding sites, (A) one for the operator and another for the cAMP. (B) one for the promoter and another for the inducer. (C) one for the operator and another for the inducer. (D) one for the promoter and another for the cAMP. (E) one for the operator and another for the CRP.
15. The ability of one site in a protein involved in control of gene expression to control the activity of another site in the same protein is called \_\_\_\_\_. (A) regulatory protein (B) activator (C) allosteric enzyme (D) inducer (E) repressor

注意：背面尚有試題

16. Replication origins in the yeast chromosome tend to be (A) A-T rich. (B) G-C rich. (C) A-G rich. (D) C-T rich. (E) A-C rich
17. How does the Lac repressor bind to the operator site? (A) One monomer binds into a single major groove of the operator. (B) One monomer binds into a single minor groove of the operator. (C) Two monomers from the active tetramer bind two successive minor grooves in the operator. (D) Two monomers from the active tetramer bind two successive major grooves in the operator. (E) All of the above are wrong.
18. Genes under negative control are (A) expressed unless switched off by an active repressor. (B) expressed only in the absence of an inactive activator. (C) expressed only in the presence of an active activator. (D) expressed only in the presence of an active repressor. (E) all of the above.
19. Eukaryotic replicons typically range in length from (A) 10~20 kbp. (B) 20~40 kbp. (C) 40~100 kbp. (D) 100~200 kbp. (E) 200~300kbp
20. Genes are assumed to share a common ancestry if
  - (A) they are found in the same organism.
  - (B) they are found in related species.
  - (C) their number and content of exons and introns are the same or similar.
  - (D) they have the same number of exons.
  - (E) they have the same number of introns.

二、名詞解釋 (一小題 5%,共 20%)

1. Single nucleotide polymorphism (SNP)
2. Replication origin
3. Leaky mutation
4. cDNA

三、問答題 (一小題 10%,共 40%)

1. Why is a preparation of DNA considered to be pure if optical density (OD)  $260/280 = 1.8$ ?  
Once DNA Ratio is higher than it what situation should be considered?
2. Please describe the principle of (1) agarose gel electrophoresis method used in biochemistry and molecular biology to separate DNA, or RNA, and (2) the most common dye- ethidium bromide (EtBr) used in the gel.
3. Professor Harald zur Hausen, one of the winners of the Nobel Prize in Physiology or Medicine 2008. What were his discoveries?
4. What is microRNA?

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