

※ 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。

Part I : 50%

一、單選題 (30 分，每題 3 分)

- 一段 double-stranded DNA 會有幾種可能的 open reading frames ?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 6
- 下列哪種 labeling nucleotide 你/妳會使用在 transcription initiation 實驗中 ?
(A) α -labeled dNTP (B) β -labeled dNTP (C) γ -labeled dNTP
- 下列哪種 labeling nucleotide 你/妳會使用在 transcription elongation 實驗中 ?
(A) α -labeled dNTP (B) β -labeled dNTP (C) γ -labeled dNTP
- 下列何者針對 *E. coli* 之 promoter 及 RNA polymerase 的敘述為「錯誤」 ?
(A) -35 sequence 有 base substitution (鹼基置換的突變) 會明顯影響 *E. coli* 的 promoter 被 RNA polymerase 認知的頻率
(B) -35 sequence 有 base substitution 會明顯影響 *E. coli* 的 promoter 與 RNA polymerase 形成 open complex
(C) -35 sequence 與 -10 sequence 之間序列有 base deletion 或 insertion 會明顯影響 *E. coli* 的 promoter 被 RNA polymerase 認知的頻率
(D) -10 sequence 類似真核生物的 RNA polymerase II 對應之 promoter 的 TATA box
- Intrinsic terminator 之 RNA 序列的特色為：
(A) GC-rich stem-loop + a run of T
(B) GC-rich stem-loop + a run of U
(C) AT-rich stem-loop + a run of T
(D) AT-rich stem-loop + a run of U.
- 下列哪種 RNA 為真核生物的 RNA polymerase II 所 transcribed ?
(A) 5SrRNA (B) 28SrRNA (C) mRNA (D) tRNA
- 真核生物位於 nucleolar 之 RNA polymerase 為
(A) RNA polymerase I (B) RNA polymerase II (C) RNA polymerase III.
- 真核生物對 α -amanitin 最為敏感者為 ?
(A) RNA polymerase I (B) RNA polymerase II (C) RNA polymerase III.

9. 下列何者「不是」epigenetic modifications？

- (A) CpG methylation (B) promoter mutation (C) histone acetylation (D) RNA interference.

10. 下列何種狀況多發生在 active chromatin 區域？

- (A) heterochromatin (B) CpG island hypermethylation (C) DNase I-sensitive regions (D) de-acetylated histone 的 chromatin

二、解釋名詞 (20 分、每題 10 分)

1. Promoter vs. Enhancer (定義、特色)

2. Basal transcription factor vs. Transcriptional activator (定義、特色、並舉一例說明)

Part II : 50%

一、問答題：50 分

1. Please define the underlined terms in words and also show the final product/s that will be generated as a result of the process “*written in Italic*” with a drawing.

(A) Chromosomes Intermolecular homologous recombination with “*single crossover*” and “*double crossover*”. (5 points)

(B) Chromosome Intramolecular homologous recombination with “*direct repeats*” and “*inverted repeats*”. (5 points)

2. Please define the underlined terms in words and also show the process “*written in Italic*” with a drawing.

(A) Origin of replication (ORI), Primosome and “*RNA priming*” during DNA replication in *E. coli*. (5 points)

(B) Semiconservative DNA Replication and the “*synthesis of the lagging strand and the leading strand*”. (5 points)

3. Please describe and compare the differences (in terms of the molecular process and the DNA repair efficiency) between Nucleotide excision repair (NER) and Non-Homologous end joining in details. (10 points)

4. Please define and describe the functions of the following terms and process in details:

(A) tRNA and tRNA Charging (5 points)

(B) Large and Small ribosomal subunit (5 points)

(C) RNA 5'-Capping and 3'-Polyadenylation (5 points)

(D) Wobble and super-Wobble hypothesis (5 points)