

請依序作答

1. 請說明 *E. coli* 的 “primosome” 及 “replisome” 分別由哪些蛋白質組成？兩者的關係為何？(10 分)
2. 請說明下列物質、技術或現象：(各 2 分，共 10 分)
 - (1) heterogeneous nuclear messenger RNA
 - (2) small nuclear ribonucleoproteins
 - (3) frameshift mutation
 - (4) nucleosome
 - (5) RFLP
3. 關於下列某基因末端序列，(共 10 分)
 - (1) 請問此序列轉錄 (transcription) 後的 RNA 序列為何 (請標示方向)? (2 分)
 - (2) 此序列可轉譯 (translation) 為 5 個胺基酸，請問認定第三個 genetic codon 之 tRNA 的 anticodon 為何？請用 wobble rules 說明。(4 分)
 - (3) 請寫出未出現於本序列的其他所有 stop codon。(4 分)

5'-ATGTTACCGGGAAAATAG-3'
3'-TACAATGGCCCTTTTATC-5'
4. 請說明 *Lac operon* 之基因結構及調控機制: (10 points)
5. 請說明真核生物需維持染色體長度的原因及機制: (10 points)
6. 親緣關係遠的兩物種雜交後代要具有稔性，請就兩者的染色體型態、數目、以致配對情形加以說明。(6%)
又如果染色體數目不同，雜交後代卻能具有稔性，可否推測其配對情形？(4%)
7.
 - a. How do you see the importance of meiosis in Life? (2%)
 - b. When does the crossing-over take place? Before or after Metaphase I? (2%)
 - c. How many crossing-over a chromosome pair may have? (2%)
 - d. How to relate Mendelism with meiosis? (4%)
8. A geneticist studying the pathway of synthesis of phenylalanine in *Neurospora* isolated several mutants that require phenylalanine to grow. Table indicated the growth performance of *Neurospora* mutants (+: growth; -: no growth):

	Additive (添加物)			
	phenylpyruvate	prephenate	chorismate	phenylalanine
Wild-type	+	+	+	+
Mutant 1	-	-	-	+
Mutant 2	+	+	-	+
Mutant 3	+	-	-	+

請寫下可能的 phenylalanine 合成途徑？(10%)

9. 試從遺傳學發展史的幾個重要里程碑說明『如何確定遺傳的物質主要為細胞核(真核生物)中的 DNA，而非蛋白質或 RNA』(10%) (提示：指用什麼方法、物質、或技術發現/確立什麼事)
10. An organism has six pairs of chromosomes.
 - a. In the absence of crossing over, how many different chromosomal combinations are possible in the gametes? (5%)
 - b. Considering crossing over, how many different chromosomal combinations are possible in the gametes? (5%)