

國立彰化師範大學103學年度碩士班招生考試試題

系所： 生物技術研究所

科目： 分子生物學

☆☆請在答案紙上作答☆☆

共4頁，第1頁

Section 1: 單選題 60%，每題2%

- DNA ligase catalyzes the formation of _____.
(a) hydrogen bonds, (b) phosphodiester bonds,
(c) sticky ends of DNA, (d) cAMP,
(e) ATP
- Which of the following statements concerning the eukaryotic chromosome is **not true**?
(a) it is composed of DNA and protein,
(b) the nucleosome is the structural subunit,
(c) it consists of a single molecule of DNA wound around nucleosomes,
(d) active transcription occurs on euchromatin,
(e) gene expression is controlled by the histones
- What information is present in a cDNA library?
(a) intron sequences, (b) promoter sequences,
(c) exon sequences, (d) RNA sequences,
(e) telomere sequences
- In prokaryotes the chromosome is held in a region called the _____.
(a) nucleoid, (b) centriole, (c) centrosome, (d) kinetochore, (e) centromere
- The enzyme that removes RNA primers during DNA replication is:
(a) RNA polymerase I, (b) RNA polymerase II,
(c) RNA polymerase III, (d) DNA polymerase I,
(e) DNA polymerase III
- Which experimental technique was utilized to show that DNA replicated by a semiconservative process?
(a) density gradient equilibrium centrifugation, (b) electron microscopy,
(c) gel electrophoresis, (d) microarray,
(e) ELISA
- The 5' UTR is _____.
(a) only found in eukaryotes,
(b) the sequence between the start of the mRNA and the start of the protein-coding sequence,
(c) created by splicing,
(d) a linkage of the 5'-phosphate at one side of the nick,
(e) in the mRNA just before the poly-A attachment sequence

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共4頁，第2頁

8. Homologous DNA recombination is mainly benefits cells by its role in
- (a) post-replication repair of DNA,
 - (b) unnatural recombination used by biotechnology,
 - (c) solving the telomere problem,
 - (d) retroviral integration into the genome,
 - (e) Replication initiation requires a primer.
9. The multiple cloning site of a vector is very useful for _____.
- (a) producing ssDNA,
 - (b) PCR amplification,
 - (c) site-specific recombination,
 - (d) directional subcloning,
 - (e) mapping the plasmid
10. If PCR is set up to cycle 25 times through 95°, 50°, 75°, what primarily is happening during the 50° step?
- (a) primer extension,
 - (b) primer annealing,
 - (c) denaturation,
 - (d) repairing,
 - (e) recombination
11. Retroviruses or RNA tumor viruses use _____ to make DNA.
- (a) DNA polymerase,
 - (b) RNA polymerase,
 - (c) DNA-dependent RNA polymerase,
 - (d) oncogene,
 - (e) reverse transcriptase
12. "Jumping genes" that have the ability to move within and between chromosomes are called _____
- (a) introns,
 - (b) transposons,
 - (c) oncogenes,
 - (d) retroviruses,
 - (e) exons
13. Which of the following enzyme activities is **not** needed for replication of the *E. coli* chromosome?
- (a) ligase,
 - (b) telomerase,
 - (c) primase,
 - (d) polymerase,
 - (e) a and c
14. What is RNA interference?
- (a) a special optical quality of RNA,
 - (b) a method to copy protein into RNA,
 - (c) a process where RNA contributes to the folding of ribonucleoproteins,
 - (d) a process in which RNA molecules inhibit gene expression by causing the destruction of specific mRNA molecules,
 - (e) the effect of incorrect aminoacyl tRNAs have on the ribosome

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共4頁，第3頁

15. Which of the following nucleotide sequences represents the complement to the DNA strand 5'-AGATCCG- 3' ?
- (a) 3'-CTCGAAT- 5', (b) 5'-CTCGAAT- 3',
(c) 5'-AGATCCG- 3', (d) 3'-TCTAGGC- 5'
(e) 3'-AGATCCG- 5'
16. 以DNA為模板合成RNA的過程稱為?
- (a) replication, (b) transcription,
(c) translation, (d) reverse transcription,
(e) transfection
17. 下列何種方法可用來分析RNA?
- (a) Western blotting, (b) Southern blotting,
(c) Northern blotting, (d) Transformation,
(e) immuno-precipitation
18. 下列何者沒有參與轉譯(translation)過程?
- (a) ribosome, (b) mRNA, (c) tRNA, (d) GTP, (e) intron
19. 原核生物轉錄過程中使用下列哪一種酵素?
- (a)DNA dependent DNA polymerase, (b)DNA dependent RNA polymerase,
(c)RNA dependent DNA polymerase, (d)RNA dependent RNA polymerase,
(e)以上皆是
20. 下列何者屬於原核生物基因的核心啟動子元件(core promoter element)?
- (a) TATA box, (b) -10 box, (c) CAAT box, (d) GC box, (e) Homeo box
21. 下列何者參與原核生物轉錄終止?
- (a) RNA polymerase α subunit, (b) RNA polymerase β subunit,
(c) RNA polymerase σ subunit, (d) RNA polymerase β' subunit,
(e) Rho factor
22. 真核生物轉錄過程中，mRNA是由以下哪一種酵素產生?
- (a) RNA polymerase I, (b) RNA polymerase II,
(c) RNA polymerase III, (d) 以上皆是,
(e) 以上皆非
23. 下列何者在轉譯過程中負責攜帶氨基酸?
- (a) rRNA, (b) tRNA, (c) mRNA, (d) siRNA, (e) miRNA

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共4頁，第4頁

24. 下列何者負責催化真核生物"RNA splicing"?
- (a) rRNA, (b) tRNA, (c) siRNA, (d) snRNA, (e) miRNA
25. 在原核生物轉譯過程中，何者負責辨認ribosome binding site?
- (a) 5S RNA, (b) 5.8S RNA, (c) 16S RNA, (d) 23S RNA, (e) 以上皆是
26. 在原核生物轉譯過程中，何者負責peptidyl transferase的功能?
- (a) 5S RNA, (b) 5.8S RNA, (c) 16S RNA, (d) 23S RNA, (e) 以上皆是
27. 下列何者在細胞中負責降解折疊錯誤的蛋白質?
- (a) proteasome, (b) mitochondria,
(c) ER, (d) proteomic,
(e) peroxisome
28. "Wobble"理論與下列何者有關?
- (a) DNA 與 RNA 配對, (b) RNA 與 蛋白質配對,
(c) mRNA 與 tRNA 配對, (d) mRNA 與 rRNA 配對,
(e) rRNA 與 tRNA 配對
29. 生命科學的中心教條(central dogma)指的是
- (a) DNA-RNA-Protein, (b) RNA -Protein-DNA,
(c) DNA-Protein-RNA, (d) Protein- RNA-DNA,
(e) Protein-DNA-RNA
30. 真核生物染色體由DNA與何種蛋白質組成?
- (a) collagen, (b) histone, (c) albumin, (d) insulin, (e) 以上皆非

Section 2 : 問答題 40%

1. You are taking an optical density measurement of a genomic DNA sample from a solution that is 3 μ l DNA (from stock solution) and 97 μ l H₂O. The OD₂₆₀ reads 0.057 (hint: 1 OD₂₆₀ unit of a double stranded DNA solution equals 50 μ g /ml).What is the concentration of the original DNA stock solution? (10%)
2. What is a sliding clamp and how does it increase the processivity of DNA polymerase during replication? (10%)
3. 欲合成真核生物 mRNA，需要 general transcription factors 的協助，進行轉錄起始(transcription initiation)，請問這些 general transcription factors 的種類，作用順序與功能為何? (10%)
4. 請舉例詳細說明如何生產重組蛋白(recombinant protein)? (10%)