

國立彰化師範大學 98 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☆☆

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一、單選題，選出最好的答案 (each 2%)

1. a, Pribnow box
b, TATA box
c, -10 box
d, CAAT box
e, -35 box
f, GC box
Which item belongs to prokaryotic core promoter elements?
(A) bd (B) ce (C) bdf (D) ace (E) abd
2. a, stimulates transcription initiation
b, governs rifampicin sensitivity
c, catalysis to form phosphodiester bonds
d, directs the core polymerases to transcribe specific gene
e, can be reused by different core polymerases
f, termination of transcription
In prokaryotic transcription, which item belong to the functions of σ factor in RNA polymerase
(A)abe (B) acd (C) ade (D) abef (E) bcdf
3. a, turned on when tryptophan is present in the growth medium
b, turned off when tryptophan is present in the growth medium
c, tryptophan as a repressor to turned off the gene transcription
d, tryptophan as a activator to turned on the gene transcription
Which item is true about the tryptophan operon?
(A) a (B) b (C) c (D) d (E) ac (F) bd
4. a, DNA methylation
b, DNA acetylation
c, histone acetylation
d, histone amplification
e, DNA amplification
Which item can be used to regulate transcription of eukaryotic cells?
(A)abe (B) cd (C) abcde (D) ac (E) bce
5. a, Box A
b, Box B
c, Box C
d, TATA box
e, GC box
Which item belongs to tRNA promoter of eukaryotic cells?
(A) ab (B) abc (C) bc (D) de (E) ade
6. a, ligase
b, helicase
c, proteinase
d, kinase
e, phosphotase
Which item belongs to the function of Transcription Factor II H (THIIIH) of eukaryote?
(A)ab (B) cd (C) ac (D) bd (E) ce
7. a, 28S RNA
b, 18S RNA
c, 5S RNA
d, 5.8S RNA
e, snRNA
f, tRNA
Which item belongs to the product of RNA polymerase I of eukaryote?
(A)ab (B) abc (C) abd (D) bcd (E) e (F) f

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8. a, The holoenzyme of RNA polymerase contained $\alpha_2\beta\beta'$
b, The σ factor mediates binding of polymerase to the promoter
c, Transcription is initiated by RNA polymerase with the need for a primer
d, The upstream promoter contained TATA box and CAAT box
e, DNA template strand also called the sense strand
Which is **not** correct about prokaryotic transcription?
(A) abcde (B) acde (C) bce (D) ade (E) abcd (F) cde
9. a, Greek key β -barrel domain
b, Leucine zippers (bZIP) motif
c, Acidic domains
d, Homeodomains
e, Proline-rich domains
f, Zinc fingers
Which can bind DNA?
(A) abd (B) bcdef (C) def (D) bdf (E) bdef
10. a, They are made up of both DNA and RNA
b, They bind to splice sites at each end of the exon
c, They joint together to form spliceosome
d, They attach introns to exons in the correct order
e, They act only in the cytosol
Which is **not** true about snRNPs?
(A) abcd (B) ade (C) abde (D) bcde (E) abe
11. DNA synthesis begins at
(A) a single location in the SV40 genome (D) the START site in yeast
(B) a single location in yeast (E) none of the above
(C) a site(s) that is G-C rich in *E. coli*
12. Which of the following is NOT TRUE for Topoisomerase II activity
(A) cuts both strands of a DNA double helix (D) requires energy supplied by ATP
(B) changes the linking number by 2 (E) b & c
(C) denatures DNA sequences
13. In prokaryotes, the lagging strand primers are removed by?
(A) 3'→5' exonuclease (D) DNA polymerase III
(B) DNA ligase (E) Primase
(C) DNA polymerase I
14. Which statement is INCORRECT about the *E. coli* DNA replication?
(A) DNA replication is semiconservative
(B) DNA polymerase I is required for the removal of the RNA primers
(C) Both DNA strands are replicated in the 5' to 3' direction
(D) The lagging strand is synthesized in segments as Okazaki fragments
(E) DNA polymerase III is involved in replicating the leading strand but not the lagging strand

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15. The discontinuous aspect of replication of DNA *in vivo* is caused by
(A) polymerase slippage (D) sister-chromatid exchanges
(B) trinucleotide repeats (E) the 5' to 3' polarity restriction
(C) topoisomerases cutting DNA in a random fashion
16. Which of the following is NOT true about DNA replication in prokaryotes?
(A) it is semi-conservative (D) no Okazaki fragments are formed
(B) it is bi-directional (E) b & d
(C) there is a single origin of replication
17. Proofreading by DNA polymerase
(A) is important only for DNA repair (D) does not require any exonuclease activity
(B) requires 3'→5' exonuclease activity (E) involves aminoacyl-tRNA synthetase
(C) requires 5'→3' exonuclease activity
18. Replication of DNA at the telomeres requires telomerase because without telomerase
(A) the telomeric DNA would get longer
(B) the telomeric DNA would be incompletely replicated
(C) the telomeric DNA would not be spliced properly
(D) the telomeric DNA would get point mutations
(E) none of the above are correct
19. What determines the nucleotide sequence of the newly synthesized strand during DNA replication?
(A) the particular DNA polymerase catalyzing the reaction
(B) the relative amounts of the four nucleoside triphosphates in the cell
(C) the nucleotide sequence of the template strand
(D) the primase used in the reaction
(E) both A and D
20. Which of the following help to hold the DNA strands apart while they are being replicated?
(A) single-strand binding proteins (D) primase
(B) ligase (E) exonuclease
(C) gyrase
21. Which of the following is NOT involved in the initiation of protein synthesis in *E. coli*?
(A) mRNA (C) tRNA^{Met}
(B) IF (D) ribosomes
22. In *E. coli*, the synthesis of peptide in protein synthesis is catalyzed by
(A) terminal transferase (C) elongation factor
(B) peptidyl transferase (D) translocase
23. Which is NOT true in the life cycles of a λ phage?
(A) increase in cI proteins promotes the lysogenic cycle whereas increase in Cro proteins promotes the lytic cycle
(B) in the lysogenic cycle, the viral DNA linearizes and integrates into the host DNA
(C) at high concentration of cI, transcriptions of both cI and Cro genes are repressed
(D) when the host DNA is damaged, the cI protein may be cleaved by certain protease promoted by the RecA protein

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24. What is the wobble position during protein synthesis?
(A) The first position of a codon (C) The third position of a codon
(B) The first position of an anticodon (D) none of above
25. Transposable element is a type of
(A) moderately repetitive sequences (C) single copy sequences
(B) highly repetitive sequences (D) none of above
26. Which of the following is NOT true of a codon?
(A) It consists of three nucleotides
(B) It may code for the same amino acid as another codon does
(C) It never codes for more than one amino acid
(D) It extends from one end of a tRNA molecule
27. Which of the following is NOT involved in SOS repair?
(A) Activation of protease activity of RecA
(B) Activation of recombination activity of RecA
(C) Binding of SOS box by a repressor
(D) Transdimer synthesis
28. EF-Tu bound to GTP is required to
(A) Bind N-formyl methionine to the first AUG in a mRNA
(B) Allow the 50S ribosome subunit to bind to the initiation complex
(C) Release the tRNA from the ribosome after it has transferred its amino acid chain to the next tRNA
(D) Position a charged tRNA into the A site of the ribosome
29. When a eukaryotic gene is spliced into the DNA of a bacterium it may well be translated, but the protein is NOT functional. What is one possible reason for this?
(A) The codons in bacteria are not the same as in eukaryotes and the protein may well not have exactly the same amino acids as it would if translated in a eukaryotic cell
(B) Many proteins need to have phosphate groups added to them and, although bacteria have kinases, the proper kinase may not be in the bacterial cell
(C) Many bacterial ribosomes will not release the eukaryotic proteins once translation has ended
(D) Bacteria lack a nucleus which is required for processing proteins
30. In normal cells a gene may code for more than one protein NOT by
(A) Using different promoters from the same DNA region
(B) Having alternative splicing of introns
(C) Using different poly-A signals from the same DNA region
(D) Having mutations at each cell cycle

二、問答題

1. Provide a method to measure the strength of a eukaryotic promoter in detail? (8%)
2. How do you know that transcription factor III A (TFIIIA) is necessary for transcription of 5S rRNA, but not for tRNA? (4%)

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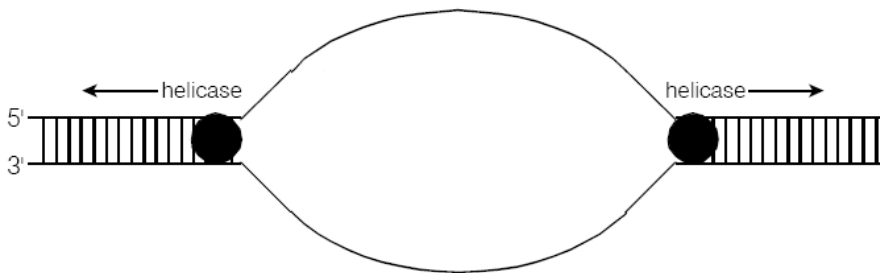
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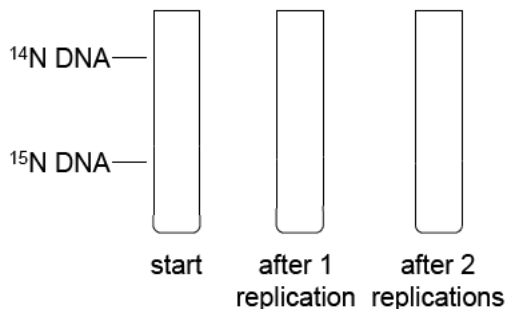
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3. The drawing below shows an origin of DNA replication. Show how the new strands would be synthesized, using rectangles to represent RNA primers and arrows to represent new DNA being made. Label your 3' and 5' ends. (8%)



4. You have just isolated the first bacterium from Mars. It has DNA much like earthly organisms, but replicates its DNA conservatively, instead of semiconservatively. Show the DNA bands you would expect to see if you carried out the Meselson-Stahl experiment for this organism. Remember, it will initially be grown on ^{15}N and then switched to ^{14}N . (8%)



5. You have performed an experiment regarding DNA repair system, so you had treated two cultures of *E. coli* with equal dose of UV light, and then sat the two cultures in the dark for a few days to see if they could recover from the damage. One culture showed full recovery from the DNA damage; nevertheless the other died completely. DNA extracted from the dead culture and examined. The result indicated that they were knocked out due to that many thymine-dimers found in the DNA and were not repaired. Why? (5%)

6. Filling blanks: (7%)

Mutagens	Mechanism	End results of mutations
5-bromouracil	Base analoge of thymine	AT→GC; GC→AT
	Deamination of adenine	
Acridine orange		
	Conversion of guanine to 7-ethyl guanine	
UV	-----	