

國立彰化師範大學 99 學年度碩士班招生考試試題

系所： 生物學系

組別： 乙組

科目： 分子生物學

☆☆請在答案紙上作答☆☆

共 4 頁，第 1 頁

Section 1: Multiple choices. Please choose **the best answer** for each question. (3% each)

1. Which enzyme catalyzes the formation of a covalent bond between adjacent 5'-P and 3'-OH termini of separate fragments of DNA.
(a) origin of replication (b) convertase (c) primase (d) ligase (e) topoisomerase
2. How many microliters (μL) would you need to pipet if you wanted to deliver 750 ng of a dsDNA to a new tube? The OD_{260} of the solution you are to pipet read 0.084.
(a) 892.9 μL (b) 63.0 μL (c) 178.6 μL (d) 252.0 μL (e) 672.0 μL
3. In prokaryotes, the lagging strand primers are removed by?
(a) 3'→5' exonuclease (b) DNA ligase (c) DNA polymerase I (d) DNA polymerase III (e) primase
4. The sequence of one strand of DNA is 5' TCGATC 3'. The sequence of the complementary strand would be:
(a) 5' AGCTAG 3' (b) 5' TCGATC 3' (c) 5' CTAGCT 3' (d) 5' GCTAGC 3' (e) 5' GATCGA 3'
5. The discontinuous aspect of replication of DNA *in vivo* is caused by
(a) polymerase slippage (d) helical structure of the DNA
(b) trinucleotide repeats (e) the 5' to 3' polarity restriction
(c) topoisomerases cutting DNA in a random fashion
6. Which RNA polymerase that produces the primer necessary for DNA synthesis?
(a) origin of replication (b) convertase (c) primase (d) ligase (e) topoisomerase
7. Replication of DNA at the telomeres requires telomerase because without telomerase
(a) the telomeric DNA would get longer
(b) the telomeric DNA would get shorter
(c) the telomeric DNA would not be spliced properly
(d) the telomeric DNA would get point mutations

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(e) None of the above is correct

Questions 8~10 refer to the proteins used during DNA replication. Choose the best answer from below:

(a) Helicase (b) Ligase (c) Primase (d) SSB (e) Topoisomerase

8. Joins Okazaki fragments together.

9. Keeps two DNA strands separated from one another.

10. Unwinds double-strand DNA.

11. An “A to C” mutation is

(a) transition (b) transversion (c) deletion (d) insertion.

12. What repair system will be activated if deamination of a cytosine happens?

(a) base excision (b) nucleotide excision (c) mismatch repair (d) none of above.

13. What repair system will be activated if damage of DNA caused by UV happens?

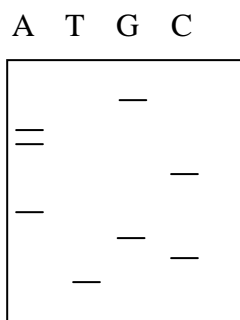
(a) base excision (b) nucleotide excision (c) mismatch repair (d) none of above.

14. Which of the followings is true in initiation of protein synthesis in *E. coli*?

- (a) The initiator tRNA enters P site of ribosome
- (b) the first amino acid brought in ribosome is fMet
- (c) IFs recruit mRNA to bind to small subunit of ribosome first, then large subunit
- (d) all of above

15. What is the result of sequencing derived from the following autoradiogram?

- (a) 5'GAACAGCTT3'
- (b) 5'TTCGACAAG3'
- (c) 5'AAGCTGTTC3'
- (d) none of above



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16. Which of the following is not true of RNA processing?
- (a) introns are excised and hydrolyzed before mRNA moves out of the nucleus
 - (b) Methylation is involved in the 5' capping of hnRNA
 - (c) RNA splicing may be catalyzed by sn RNPs
 - (d) A highly conserved sequence AAAUAA is present downstream of the site of poly-A tail, and provides a signal for cleavage
17. Which way are the amino acid and tRNA attached in a charged tRNA?
- (a) Amino acid-5'tRNA3'-AMP
 - (b) Amino acid-AMP-3'tRNA
 - (c) AMP-amino acid-3'tRNA
 - (d) Amino acid-3'tRNA5'-AMP
18. The wobble hypothesis would predict that molecules of tRNA that contain which of these anticodons could pair with the codon 5' ACG 3'?
- (a) 3' UGU 5'
 - (b) 3' UGG 5'
 - (c) 3' AGU 5'
 - (d) 3' AGC 5'
19. During the splicing of an intron,
- (a) transesterification is not performed until U4 is released
 - (b) UACUAAC is a "branch site", which can be bound by U1
 - (c) AG-2'-5'A bond is formed transiently
 - (d) U6 facilitates release of lariat and ligation of the two exons
20. A polypeptide of 10 amino acids is synthesized in *E. coli*. How many phosphate bonds is cost after completion of the polypeptide?
- (a) 38, (b) 39, (c) 40, (d) 41.

Section 2 : Fill the blanks (2% each)

1. In central dogma, a process from RNA to DNA is called _____.
2. _____ is the entire stretch of DNA that includes the operator, the promoter, and the genes that they control in bacteria.
3. A stage of RNA processing in the eukaryotic nucleus, which is the removal of introns and produce more than one kind of polypeptides. _____

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4. RNA fragments from a gel are transferred to a nitrocellulose paper and hybridize with specific probe, this procedure is called _____.
5. The phenomenon in which RNA molecules in a cell are destroyed if they have a sequence complementary to an introduced short double-stranded RNA. _____
6. The enzymes can recognize DNA palindromic sequence and cut it. _____
7. _____ can be used in comparing pattern of many genes expression in different tissues, at different times, or under different conditions.
8. In mRNA splicing, which part was splice-out? _____
9. To initiate transcription, eukaryotic RNA polymerase requires the assistance of proteins called _____.
10. Which molecule contains anti-codon? _____

Section 3 : Short Answer

1. Please describe and calculate how to make a 500 mL solution that is 10 mM NaCl, 10% NP-40 (v/v if the stock solution of NP-40 is 50% w/v), 1 mM Tris-HCl, pH 7.5. (FW= formula weight; FW NaCl = 58.44; FW Tris = 121; FW SDS = 288.4) (5%)
2. Suppose you started your PCR with only 1 template. After 4 complete cycles of PCR, how many pieces of the exact double-stranded product will you have? Please show your work for credit (don't forget to indicate 5' and 3' ends of the DNA molecules). (5%)
3. Please describe the transcription initiation by RNA polymerase II in eukaryote. (5%)
4. How to create a full-length cDNA library? (5%)