

臺北醫學大學 103 學年度碩士班暨碩士在職專班招生入學考試

分子生物學試題

本試題第 1 頁；共 3 頁
(如有缺頁或毀損，應立即請監試人員補發)

注意事項	一、本試題共二大題，共計 100 分。 二、請將最適當的答案依題號作答於答案卷上。 三、試題答錯者不倒扣；題次號碼錯誤或不按順序或鉛筆作答，不予計分。
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一、選擇題：每題 2%，共 50%

- During DNA replication, the primers used for leading and lagging strand initiation must be removed by what kind of enzymatic activity?
Ⓐ 3' to 5' exonuclease Ⓑ 5' to 3' exonuclease Ⓒ 3' to 5' endonuclease Ⓓ 5' to 3' endonuclease
- Which of the following processing events occurs in the generation of mature tRNA molecules?
Ⓐ Polyadenylation at the 3' end Ⓑ Addition of a 5' cap
Ⓒ Covalent modification of bases Ⓓ Intron removal to create an ORF
- Which of the following statements about rRNA molecules is true?
Ⓐ The presence of modified nucleotides predominantly determines structure
Ⓑ Each molecule folds into a common 3D structure for function
Ⓒ They undergo extensive processing to add a cap and poly A tail
Ⓓ They function as complex protein: RNA complexes
- Targeting of a particular mRNA by a miRNA would likely result in:
Ⓐ A gene knockout Ⓑ An alternatively spliced product
Ⓒ A gene knockdown Ⓓ Translational activation
- The histone modification of sumoylation usually results in:
Ⓐ Increased acetylation and ubiquitylation of other histones
Ⓑ Gene activation
Ⓒ Gene silencing
Ⓓ Recruitment of transcription factors
- Which post-translational modification is most commonly occurred to alter the activity of enzymes in response to hormones such as glucagon stimulation?
Ⓐ Acetylation Ⓑ Site specific proteolysis Ⓒ Hydroxylation Ⓓ Phosphorylation
- Phosphorylation of lysine residue number four on the N-terminal tail of core histone protein 2B can ultimately result in the increased expression of nearby gene clusters, such as the alpha globin genes. This is an example of what level of gene regulation?
Ⓐ Transcriptional Ⓑ Translational Ⓒ RNA stability Ⓓ Post-translational
- Which of the following pairs of mitotic/meiotic phases involves the splitting of centromeres?
Ⓐ Anaphase of mitosis and anaphase of meiosis II Ⓑ Prophase of mitosis and anaphase of meiosis I
Ⓒ Anaphase of mitosis and anaphase of meiosis I Ⓓ Telophase of mitosis and metaphase of meiosis II
- Which of the following processes is unique to bacteria?
Ⓐ Cotranslational transport Ⓑ Coupled transcription and translation
Ⓒ Chaperone-aided protein folding Ⓓ Post-translational protein modifications
- Which of the following is the site of DNA methylation?
Ⓐ a cytosine linked to another cytosine by a phosphodiester bond (5'-CpC)
Ⓑ a guanine linked to cytosine by a phosphodiester bond (5'-GpC)
Ⓒ a guanine base paired to a cytosine
Ⓓ a cytosine linked to a guanine by a phosphodiester bond (5'-CpG)

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分子生物學試題

本試題第 2 頁；共 3 頁
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11. Which of the following membrane receptors is activated by forming dimers, adding phosphate groups, and then activating relay proteins?
Ⓐ G protein-coupled receptors Ⓑ ligand-gated ion channels
Ⓒ steroid receptors Ⓓ receptor tyrosine kinases
12. Which enzyme catalyzes the elongation of a DNA strand in the 5'→3' direction?
Ⓐ DNA polymerase Ⓑ DNA ligase Ⓒ topoisomerase Ⓓ helicase
13. One of the possible results of chromosomal breakage is for a fragment to join a nonhomologous chromosome. What is this alteration called?
Ⓐ transversion Ⓑ translocation Ⓒ inversion Ⓓ duplication
14. Which of the following does not occur in prokaryotic gene expression, but does in eukaryotic gene expression?
Ⓐ mRNA, tRNA, and rRNA are transcribed
Ⓑ RNA polymerase binds to the promoter
Ⓒ A poly-A tail is added to the 3' end of an mRNA and a cap is added to the 5' end
Ⓓ Transcription can begin as soon as translation has begun even a little
15. The Shine-Dalgarno sequence is found on the _____.
Ⓐ small ribosomal subunit Ⓑ large ribosomal subunit
Ⓒ initiator tRNA Ⓓ mRNA
16. Alternative RNA splicing
Ⓐ is a mechanism for increasing the rate of transcription
Ⓑ can allow the production of proteins of different sizes from a single mRNA
Ⓒ can allow the production of similar proteins from different RNAs
Ⓓ increases the rate of transcription
17. Which of the following events is a function of a signal peptide?
Ⓐ to translocate polypeptides across the ER membrane
Ⓑ to bind RNA polymerase to DNA and initiate transcription
Ⓒ to direct an mRNA molecule into the cisternal space of the ER
Ⓓ to signal the initiation of transcription
18. Which of the following molecules is not directly involved in translation?
Ⓐ mRNA Ⓑ DNA Ⓒ tRNA Ⓓ GTP
19. Which of the following experimental procedures is most likely to hasten mRNA degradation in a eukaryotic cell?
Ⓐ removal of the 5' cap Ⓑ enzymatic shortening of the poly-A tail
Ⓒ methylation of C nucleotides Ⓓ removal of one or more exons
20. Genomic imprinting, DNA methylation, and histone acetylation are all examples of
Ⓐ genetic mutation Ⓑ chromosomal rearrangements
Ⓒ epigenetic phenomena Ⓓ translocation
21. The phenomenon in which RNA molecules in a cell are destroyed if they have a sequence complementary to an introduced double-stranded RNA is called
Ⓐ RNA interference Ⓑ RNA obstruction Ⓒ RNA blocking Ⓓ RNA targeting
22. Which of the following enzymes is used to make complementary DNA (cDNA) from RNA?
Ⓐ restriction enzymes Ⓑ reverse transcriptase Ⓒ DNA ligase Ⓓ endonuclease

23. What is proteomics?
- Ⓐ the study of the full protein set encoded by a genome
 - Ⓑ the totality of the functional possibilities of a single protein
 - Ⓒ the study of how amino acids are ordered in a protein
 - Ⓓ the study of how a single gene activates many proteins
24. Which of the following techniques describes the transfer of polypeptides to a membrane for gene expression analysis?
- Ⓐ Southern blotting Ⓑ Northern blotting Ⓒ Western blotting Ⓓ Eastern blotting
25. In recombinant DNA methods, the term “vector” can refer to
- Ⓐ the enzyme that cuts DNA into restriction fragments
 - Ⓑ the sticky end of a DNA fragment
 - Ⓒ a SNP marker
 - Ⓓ a plasmid used to transfer DNA into a living cell

二、問答題：共 50%

1. The Leading strand during DNA replication only requires one RNA primer, while the Lagging strand requires many RNA primers. Explain the reason in detail. (10%)
2. Draw a nucleotide that makes DNA sequencing possible (not an ordinary nucleotide). To receive full credit, you must draw all of the atoms except for the base which you may label with a single letter. Also, label the 5' and 3' ends properly. (10%)
3. Please write down the function of each of the following in a PCR reaction. (10%)
 - (1) Taq
 - (2) dNTPs
 - (3) 55°C
 - (4) 95°C
4. What is a ribozyme? (10%)
5. What are the scaffold proteins in signal transduction pathways? (10%)