

※ 考生請注意：本試題不可使用計算機

1. What is triplex forming oligonucleotide (TFO)? How does TFO form specific binding to the DNA? What are the known functions that TFO may play in the regulation of cellular functions? (15 points)
2. Please describe how to identify the transcription factors of a known gene regulatory element? (10 points)
3. How does eukaryotic cells get ATP? Please describe all possible pathways. (10 points)
4. What are the methods to resolve 3D structure of a macromolecule? Please compare the advantages and limitations of each method. (20 points)
5. Please compare and describe the difference between human mitochondria genome and the nuclear genome. (12 points)
6. Please describe the molecular organization of eukaryotic genome from DNA to chromosome. (12 points)

7. Multiple choices: (21 points, 3 points each)

(1) Reverse transcription may occur in which of the following situations?

- A. During a DNA-replication cycle of a thermophilic bacterium.
- B. During the life cycle of retroviruses.
- C. In the translation process
- D. During a replication cycle of mitochondrial DNA.
- E. In HBV life cycle

(2) Which one of the following enzymes catalyzes mRNA synthesis in the eukaryotic nucleus?

- A. RNA polymerase I
- B. RNA polymerase II
- C. T7 RNA polymerase
- D. RNA polymerase III
- E. AMV reverse transcriptase
- F. None of the above catalyze mRNA synthesis

(3) What is a restriction endonuclease?

- A. Enzyme that helps digest lipid
- B. Helps release Cytochrome C to set off a chain reaction that stops cellular respiration.
- C. An enzyme which cuts double-stranded DNA at specific, often palindromic sequences.
- D. Enzyme that cuts DNA at its 5'-end

(背面仍有題目,請繼續作答)

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考試科目：分子生物學

考試日期：0224，節次：3

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(4) Which of the following pairs of amino acids with thiol group that could form cross-link in protein structure and covalent bond with gold nanoparticles?

- A. asparagine (Asn, N)
- B. cysteine (Cys, C)
- C. histidine (His, H)
- D. tryptophan (Trp, W)
- E. glutamine (Gln, Q)

(5) What are the proteins that protect DNA in eukaryotic cells?

- A. histones
- B. transcription factors
- C. ribosome
- D. integrin
- E. none of the above

(6) Which of the following is not a pathway that might lead to cell death?

- A. apoptosis
- B. glycolysis
- C. autophagy
- D. necrosis
- E. all of above

(7) Which of the following is an epigenetic regulation of gene expression?

- A. DNA methylation
- B. Histone methylation
- C. Acetylation of Cytidine
- D. Chromosome translocation
- E. non of above