

考生注意事項：所有考題務必在答案卷上作答，在問題卷上作答者不計分。

I. 選擇題 (1-10 題，每題三分，答錯倒扣 0.75 分，均為單選)

1. Which of the following radiolabeled compounds is (are) most commonly used for studying DNA synthesis in cell-free extracts?
  - a. [ $^3\text{H}$ ] thymidine
  - b. [ $^{14}\text{C}$ ]uridine
  - c. [ $\gamma$ - $^{32}\text{P}$ ]dATP
  - d. [ $\alpha$ - $^{32}\text{P}$ ] dATP
  - e. [ $^{32}\text{P}$ ]orthophosphate
2. If the sequence of an oligonucleotide, reading from the bottom to the top of a sequencing gel, is TGCAAT, the sequence of the template from which it is synthesized is
  - a. (5')TGCAAT(3')
  - b. (3')TGCAAT(5')
  - c. (5')ACGTTA(3')
  - d. (3')ACGTTA(5')
  - e. (5')AATGTC(3')
3. The cAMP receptor protein (CRP):
  - a. Stimulates replication.
  - b. Inhibits transcription
  - c. Binds the promoter region of the appropriate operon in the presence of cAMP.
  - d. Binds the operator gene in the absence of cAMP.
  - e. Binds the regulator gene in the presence of cAMP and stimulates the synthesis of repressor proteins.

(背面仍有題目,請繼續作答)

4. Which of the following is most responsible for regulating the level of eukaryotic mRNA gene products?
- Chromatin structure.
  - Transcript transport.
  - Translational initiation.
  - Transcriptional initiation.
  - Post-translational processing and transport.
5. Most mRNA molecules formed in the nucleus of an animal cell undergo which of the following?
- The formation of a large precursor RNA is followed by exon rearrangement to yield the mature mRNA.
  - Nuclear processing mechanisms modify both the 5' and 3' ends.
  - Transport out of the nucleus for intron removal.
  - Cytoplasmic processing of the 5' and 3' ends.
  - Removal of the poly(A) tail following completion of translation.
6. The sequence of an mRNA molecule synthesized from a DNA template strand having the sequence 5' CTA TTT AAA AGC CAT 3' is:
- 5' CUA UUU AAA AGC CAU 3'.
  - 5' CAU AGG AAA UUU CUA 3'.
  - 5' ATG GCT TTT AAA CTA 3'.
  - 5' AUG GCU UUU AAA UAG 3'.
  - 5' UAC CGA AAA UUU AUC 3'.
7. Synthesis of tryptophan in *E. coli* is inhibited by
- Repressor binding of tryptophan
  - Reduced levels of charged trp-tRNAs
  - Decreased levels of glucose leading to an increase in cAMP levels.
  - Repressor release of tryptophan.
  - Binding of CRP-cAMP to the trp operon.

8. Translation in eukaryotes differs from that in prokaryotes with respect to:
- The use of UGG as a termination codon instead of UAG.
  - The use of AUA as the initial codon for methionine.
  - The presence of many more releasing factors at termination.
  - The larger size of ribosomes found in the cytoplasm.
  - The fact that eukaryotic translation utilizes the same proteins for initiation and elongation.
9. The term semi-conservative replication refers to:
- The fact that the newly synthesized strands of DNA associate with each other.
  - The fact that the newly synthesized strands of DNA associate with their respective template strands.
  - The fact that some of the enzymatic machinery is utilized simultaneously to synthesize both strands of the duplex.
  - The fact that two distinct DNA polymerases are required to complete the replication process.
  - The fact that all of the enzymatic machinery is utilized simultaneously to synthesize both strands of the duplex.
10. What is meant by the statement that DNA synthesis is discontinuous?
- Replication of different regions of the DNA occurs at different times.
  - One direction of synthesis from an origin of replication is carried out following completion of synthesis in the opposing direction.
  - One strand of the DNA duplex is replicated in short stretches as opposed to continuously as for the opposite strand of the duplex.
  - One chromosome is replicated at a time before the enzymatic machinery can begin the replication of additional chromosomes.
  - The order of events requires that the helix must first be unwound, then single stranded regions stabilized by protein binding then an RNA primer synthesized prior to actual DNA synthesis.

## II. Essay question: ( 11-22 題 )

11. Please describe how to define one unit of restriction enzyme activity, what is star activity and which factors may result in star activity? (6%)
12. Please describe the polymerase chain reaction and how to do the polymerase chain reaction? (6%)
13. Would you Please describe how to inhibit or block a gene function or activity and to generate the gene knock out mice? (6%)
14. Please design a method to mutagenise a gene at specific position? (6%)
15. Please describe what is mitosis and meiosis? (6%)
16. Please describe what is map unit (centimorgan)? (5%)
17. Please describe the dominant negative mutation? (5%)
18. Describe the aspect of eukaryotic chromosomal replication that requires a reverse transcriptase-like activity. (6%)
19. In the chromosomal DNA replication of *E. coli*, DNA polymerase I is required for replication of the lagging strand. What are the unique properties of bacterial DNA polymerase I that make this enzyme essential to replication of the lagging strand? (6%)
20. Chromosome (DNA) walking is molecular technique to isolate contiguous regions of genomic DNA. Briefly describe the method of this technique. (6%)

21. RNAs that are capable of self-splicing have been referred to as catalytic RNAs. Discuss how these RNAs are similar to and different from protein enzymes. (6%)
22. Briefly describe the molecular mechanism of antitermination. How does it resemble and differ from the molecular mechanism of attenuation? (6%)