

國立清華大學 105 學年度碩士班考試入學試題

系所班組別：生命科學院甲組、醫學生物科技學程

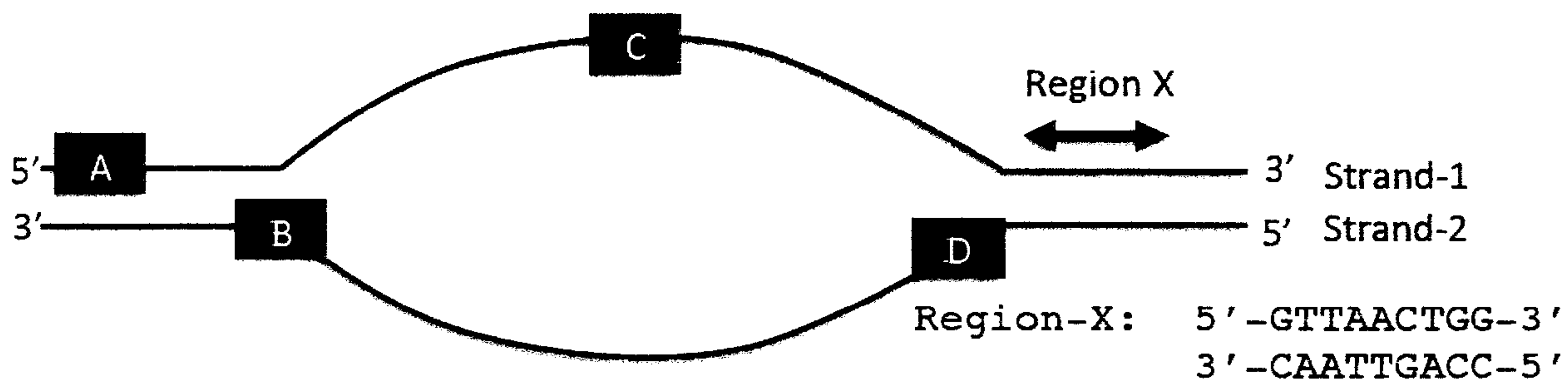
考試科目（代碼）：生物學(0402、0702)

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*請在【答案卷】作答

單選題（一題 3 分，請直接在答案卷上作答）

Consider the DNA structure that is found on a chromosome during DNA replication.
The sequence of the region-X is shown in below.



1. Which DNA segment contains the *Ori* sequence?
(A) Segment A
(B) Segment B
(C) Segment C
(D) Segment D
2. Assume that a lagging strand is made from the Region X, what will be the sequence of this lagging strand?
(A) 5'-CCAGTTAAC-3'
(B) 5'-GTTA ACTGG-3'
(C) 5'-GGTCAATTG-3'
(D) 5'-CAATTGACC-3'
3. Which of the following statements is not true concerning DNA replication in prokaryotes?
(A) Semidiscontinuous
(B) Semiconservative
(C) RNA dependent.
(D) There is one terminus of replication.
(E) There is one origin of replication.

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4. Which of the following best explains why the two DNA polymerase proteins that are held by the sliding clamp are oriented in the opposite directions?
- (A) The efficiency of replication is increased if the two DNA polymerases synthesize the template in the opposite directions
 - (B) DNA polymerase is such a large protein complex that steric hindrance prevents both polymerases from following the replication fork
 - (C) DNA polymerase can read only the template from 5' to 3' direction and the template strands are aligned in an anti-parallel direction
 - (D) DNA polymerase can read only the template from 3' to 5' direction and the template strands are aligned in an anti-parallel direction
 - (E) None of the above
5. DNA sequences that are rich in guanine and cytosine are called _____ and are usually targets of _____ on heterochromatin.
- (A) interins; acetylation
 - (B) promoters; transcriptional regulation
 - (C) enhancers; mediator binding
 - (D) GC islands; methylation
 - (E) GC islands; acetylation

簡答題（請直接在答案卷上作答）

6. Explain how does microRNA affect gene expression in eukaryotic cells. (5%)
7. Please describe (a) how receptor tyrosine kinase acts through Ras-dependent pathway to promote cell proliferation, and (b) how Transforming growth factor β receptor pathway inhibits cell division. (10%)
8. Please explain how p53 and Rb function as tumor suppressor genes, respectively? (10%)
9. What strategies do you use to develop the Dengue virus vaccine? (4%)

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10. Which virus(es) may be utilized in cancer therapy? Why? (4%)
11. Please describe viral evasion strategies in host immune system. (3%)
12. What is naked DNA vaccine? (4%)
13. What do you know about Middle East respiratory syndrome virus? (3%)
14. What is the acquired immune response? (2%)
15. What is the refractory period in neural signal propagation? How does the refractory period occur? Why is the refractory period important? (10%)
16. How can the cochlea distinguish pitch (the frequency of the sound wave)? (10%)
17. What is the thermocline? What makes it turnover, and how? (10%)
18. Use trophic efficiency to explain ecological pyramids. (10%)