

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. 2017 Nobel Prize in Physiology or Medicine was awarded to Jeffrey C. Hall, Michael Rosbash, Michael W. Young for their discoveries of molecular mechanisms controlling the circadian rhythm". Describe briefly their important discoveries? What are their significance and impact on biomedical research? (10%)
2. What are transcription, translation, and post-translational modifications? Give three examples of post-translational modifications and explains how they are regulated? (8%)
3. What is "Nuclear receptor"? What are the protein domain characteristics for the nuclear receptor? What is the action mechanism for nuclear receptor? (8%)
4. What are transrepression and transactivation? Briefly describe how these two actions work? (8%)
5. What is RNA interference (RNAi)? Give three examples to achieve RNA interference and explain how they work? (10%)
6. Please describe the differences between reverse transcription-PCR (RT-PCR) and standard PCR? For what purpose would you use RT-PCR? (6%)
7. Please briefly describe the following terms. (20%)
 - (1) Promoter
 - (2) RNA polymerase
 - (3) Chromatin
 - (4) Lagging strand
 - (5) Alternative splicing
8. Please briefly describe the following methods. (20%)
 - (1) Gel electrophoresis
 - (2) Next generation sequencing
 - (3) Real-time PCR
 - (4) Immunoblotting
 - (5) Genome editing
9. What are the biological functions of the following four RNA molecules: microRNA, pre-mRNA, siRNA, and tRNA ? (10%)