1. Please describe the biology, molecular mechanism, and applications of RNA Interference. Please include the key cellular components involving in the pathway (12%)
2. The Nobel Prize in Physiology or Medicine 2012 was awarded jointly to Sir John B. Gurdon and Shinya Yamanaka "for the discovery that mature cells can be reprogrammed to become pluripotent". Please describe the molecular methods Drs. Gurdon and Yamanaka used, **respectively**, and what they found in details. (8%)
3. In eukaryotes, control of gene expression is complex and can happen at many different levels. Please describe the process of epigenetic gene regulation in eukaryotic cells. State at least **four** different mechanisms of regulation. (8%)
4. Please explain the process of Translation in prokaryotes. State any **four** differences between prokaryotic and eukaryotic translation. (8%)
5. If an mRNA loses its 5' cap, how will its properties differ from a capped mRNA? State any **four** possible results. (8%)
6. The Nobel Prize in Physiology or Medicine 2023 was awarded jointly to Katalin Karikó and Drew Weissman "for their discoveries concerning nucleoside base modifications that enabled the development of effective mRNA vaccines against COVID-19" Please describe what they found and how does it lead to the idea of mRNA vaccines in details. (6%)
7. Please list the differences between DNA replication and RNA transcription. (15%)
8. Please describe the benefits when the genetic code is nearly universal. (10%)
9. Please explain a major difference between site-specific recombination and transposition. (15%)
10. The SOS response can be triggered by severe DNA damage in *E. coli*. Please describe the mechanisms of the repair system of SOS response. (10%)

試題隨卷繳回