

※ 注意：請於答案卷上依序作答，並應註明作答之部份及其題號。

Part I 簡答題 (50%, 5% each)

- (1) Describe the mismatch repair (MMR) system in *E. coli*.
- (2) How Dam methylase in the regulation of chromosome replication in *E. coli* ??
- (3) What is "SOS response" ??
- (4) Describe the control of ColE1 plasmid replication.
- (5) What is siRNA, miRNA, RNAi ??
- (6) Describe septum formation and localization control in *E. coli*.
- (7) 3'-OH is essential for DNA replication/elongation; please describe 3 different ways to provide the 3'-OH in a priming reaction.
- (8) How to deal with the oxidized 8-oxoguanine (oxoG) by BER in *E. coli*.
- (9) Describe the following factors required for the eukaryotic growth factor (GF) signal transduction pathway to permit cell cycle progression: RTK, Grb2, SOS, RAS, RAF, MEK, ERK, scaffolding proteins CNK and KSR, Rb/E2F, cyclin/CDK complex.
- (10) Describe the conserved non-homologous end joining (NHEJ) mechanism

Part II (50%)

A Define and explain the following terms (20%, 4% each)

1. Euchromatin
2. Ribozyme
3. CRISPR/Cas9
4. Yeast two-hybrid
5. nucleosome

B Short essays (30%, 10% each)

1. What is mRNA alternative splicing? Describe the components and processes in the mRNA splicing.
2. What is epigenetic inheritance? What kinds of chromosomal modifications are associated with epigenetic regulations?
3. Compare the differences between Prokaryotic and Eukaryotic transcription initiation. (for example, subcellular localization, template, and regulators)