

國立嘉義大學 97 學年度

農學研究所博士班招生考試試題

科目：分子生物學

1. Questions regarding transcription:
 - a. There are 2 proposed models for how transcription by eukaryotic RNA Polymerase II terminates after transcribing a gene. Please describe these 2 models as your knowledge. (14%)
 - b. The length of a particular gene DNA, measured from the start site for transcription to the end of the protein-coding region, is 12,000 nucleotides, whereas the length of the mRNA produced from this gene is 4000 nucleotides. The gene belongs to prokaryotic or eukaryotic? What is the most likely reason for this discrepancy? (6%)
 - c. "Since introns do not contain protein coding information, they do not have to be removed precisely (meaning, a nucleotide here and there should not matter) from the primary transcript during RNA splicing." Is this statement TRUE or FALSE? Explain your answer. (5%)
2. Please describe 5 mechanisms for gene regulation at the post-transcriptional level in eukaryotic cells? (25%)
3. Molecular biologists use a variety of techniques to determine protein-protein interaction which might be involved in certain signal transduction pathways. Describe at least three methods for proving protein-protein interaction. (25%)
4. The effects of various inhibitors of DNA synthesis have been investigated in an *in vitro* replication system containing *E. coli* enzymes. In such a system, replication of bacteriophage M13 DNA, a 6.4-kb molecule, is sensitive to rifampicin, an inhibitor of host-cell RNA polymerase, whereas replication of the *E. coli* cellular DNA is not inhibited by rifampicin.
 - a. What do these results imply about the priming enzymes involved in replication of M13 DNA and *E. coli* DNA? (10%)
 - b. What would be the effect of a mutation in the 5' → 3' exonuclease activity of DNA polymerase I on the replication of *E. coli* DNA? Would you expect such a mutation to be lethal? (15%)