

共八題，每題 12.5 分

- Describe the properties of enzymes that permit (a) cloning of DNA, (b) DNA sequencing, (c) the polymerase chain reaction, and (d) production of cDNA (complementary DNA)?
- Methionine is one of two amino acids with only one codon. How does the single codon for methionine specify both the initiating residue and interior Met residues of polypeptides synthesized in *E. coli*?
- (a) What are the general characteristics of bacterial transposons and viral retrotransposons? (b) What are the biological effects of transposition?
- Describe the use of a reporter gene to measure the strength of a promoter, giving two examples.
- (a) Why do eukaryotes need telomeres, while prokaryotes do not? (b) What is the enzyme involved in maintaining telomere length and what is its mechanism of action?
- You suspect that a repeated sequence just upstream of a gene is acting as an "enhancer". Describe and give the results of an experiment that would test your hypothesis.
- John Davidson picked mushrooms in a wooded area near his home. A few hours after eating one small mushroom, he experienced mild nausea and diarrhea. He went to the hospital emergency room, where a poison expert identified the mushrooms as *Amanita phalloides* (the "death cap"). This kind of mushrooms contains a toxin, which initially causes gastrointestinal disturbances, then electrolyte imbalance and fever, followed by liver and kidney dysfunction. Between 40% to 90% of the individuals who ingest the toxin die within a few days. John weighs about 90 kg. An average-size mushroom weighs about 50 g and contains about 7 mg of the toxin. The LD₅₀ (the oral dose that kills 50% of those who ingest the toxin) is 0.1 mg/kg body weight). (a) What is the toxin in the mushroom called? (b) What is the mode of action of this toxin? (c) Is John Davidson likely to survive his mushroom poisoning?
- You have isolated a virus gene that encodes a protein in which you are interested. On the drawing below, indicate and describe sequences or sites that you will need to get this gene transcribed, translated, and regulated in *E. coli*.

