

※ 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。

## 微生物學

- (1) Please define the terminology terms of Microbiology and indicate/contrast the possible relationships.
  - (a) Biofilm and Quorum Sensing (6 pts)
  - (b) VBNC and Pathogen (6 pts)
  - (c) Prokaryote and Eukaryote (6 pts)
  - (d) ABC Transporter and Group Translocation (6 pts)
  - (e) Coliform and *Escherichia coli* (6 pts)
  - (f) Bacterial Transformation and Bacterial Conjugation (6 pts)
  - (g) Respiration and Fermentation (6 pts)
  
- (2) Please describe how to use the real-time polymerase chain reaction technique for quantifying the microbial population. (10 pts)
  
- (3) You have been hired to implement a bioremediation project to clean up a site in which the groundwater is contaminated with the aromatic hydrocarbons such as benzene, toluene and xylene.
  - (a) On your knowledge of Microbiology, please briefly define the “bioremediation” technology. (4 pts)
  - (b) What microbiological strategy or approach will you apply to remedy the groundwater aromatic hydrocarbons? Why will you plan to do so? Please briefly describe your plan (10 pts).
  - (c) What environmental factors should you consider or control during the operation of your bioremediation work (5 pts).
  
- (4)
  - (a) Please write the Monod equation and define each of the constants. (5 pts)
  - (b) There are two special cases when the Monod equation can be simplified. Discuss these cases and the simplified Monod equation that results. (10 pts)
  
- (5)
  - (a) Please compare and contrast the cell walls of gram-positive bacteria and gram-negative bacteria. Include labeled drawings in your discussion. (8pts)
  - (b) Please describe the Gram stain procedure and explain how it works. (6pts)