

※ 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。

**(1)** [Terminology] Please briefly explain or describe the terminology below.

- (a) Anammox bacteria (4pts)
- (b) Quorum sensing (4pts)
- (c) Calvin cycle (4pts)
- (d) Monod equation (4pts)
- (e) Melting temperature of DNA (4pts)

**(2)** Anaerobic digestion process is now increasingly used for treatment of complex substance in waste/wastewater and recovery of renewable energy. **(a)** Please describe the principle of anaerobic digestion, for example, how cellulose (纖維素), a kind of polysaccharide is degraded and renewable energy produced (15 pts). The anaerobic microorganisms have to work closely in the degradation of the compounds. This microbial interaction is called syntrophy or syntrophic association. **(b)** Please explain the microbial syntrophy based on the underlying thermodynamics (5pts).

**(3)** Cell membranes are absolutely required for the living microorganisms. In nature, the membrane structures are varied between *Bacteria* and *Archaea*. Please compare and contrast the cell membrane of *Bacteria* and *Archaea*. Include labeled drawing in your discussion. (16%)

**(4)** In microbial catabolism, the adenosine 5'-triphosphate (ATP), energy currency of the cell, can be generated by three mechanisms? What are they? Please describe them briefly. (15 pts)

**(5)** Please describe how you distinguish gram-positive and gram-negative bacteria (10pts).

**(6)** *Escherichia coli* is an indicator for fecal pollution, and its cell is reproduced by binary fission.

- (a)** In a closed system, the growth of *E. coli* usually has four distinct phases. Please draw a growth curve and briefly describe the four phases accordingly. (4pts)
- (b)** Please correlate the "VBNC" status to the growth curve (2 pts) and provide your comments on use of *E. coli* as an indicator regarding the safety of drinking water (3pts).
- (c)** Please estimate the generation time of *E. coli* based on the experimental data obtained in a batch culture. (10pts)

編號： 153

國立成功大學 104 學年度碩士班招生考試試題

系所組別：環境工程學系丙組

考試科目：微生物學

考試日期：0211

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Time (hr)	Number of cell
0	$1 \times 10^2$
2	$1 \times 10^2$
4	$1 \times 10^2$
6	$1 \times 10^3$
8	$1 \times 10^4$
10	$1 \times 10^5$
12	$1 \times 10^6$
14	$1 \times 10^7$