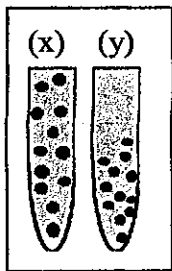


Part A (50%) ※ 注意：請於試卷內之「非選擇題作答區」依序作答，並應註明作答之大題及小題題號。

- I. (1) Describe the differences of cell walls between Gram positive and Gram negative. (4%) (2) Please rearrange the order of the reagents below used in Gram-staining procedure. (3%) (A) Alcohol (B) Safranin (C) Water (D) Crystal violet (E) Iodine
- II. Please indicate the differences of "Primary active transport" and "Secondary active transport". (5%)
- III. The table below is the comparison of Bacterial and Archaeal cells. Please check (v) the correct descriptions for each. (10%)

	Bacteria	Archaea
Cell wall	<input type="checkbox"/> peptidoglycan <input type="checkbox"/> polysaccharides <input type="checkbox"/> S-layer	<input type="checkbox"/> peptidoglycan <input type="checkbox"/> polysaccharides <input type="checkbox"/> S-layer
Ribosome size	<input type="checkbox"/> 70S <input type="checkbox"/> 80S	<input type="checkbox"/> 70S <input type="checkbox"/> 80S
Chromosome	<input type="checkbox"/> Double-stranded DNA <input type="checkbox"/> Single-stranded DNA <input type="checkbox"/> Circular DNA <input type="checkbox"/> Linear DNA	<input type="checkbox"/> Double-stranded DNA <input type="checkbox"/> Single-stranded DNA <input type="checkbox"/> Circular DNA <input type="checkbox"/> Linear DNA
Capsules or slime layers	<input type="checkbox"/> Common <input type="checkbox"/> Rare	<input type="checkbox"/> Common <input type="checkbox"/> Rare
External structures	<input type="checkbox"/> pili <input type="checkbox"/> Cannulae <input type="checkbox"/> Hami <input type="checkbox"/> Flagella	<input type="checkbox"/> pili <input type="checkbox"/> Cannulae <input type="checkbox"/> Hami <input type="checkbox"/> Flagella



- IV. You grow the bacteria x and bacteria y in the tubes and see the growth as left. (1) Please indicate the relationship to oxygen for each situation: (A) Obligate aerobe (B) Microaerophile (C) Strick anaerobe (D) Facultative anaerobe (E) Aerotolerant anaerobe (2) Please indicate if the bacteria (x) and (y) have superoxide dismutase (SOD) or catalase. (6%)

- V. Please describe the mechanism of action of the antibiotics below. (1) Vancomycin (2) Tetracyclines (3) Rifampin (6%)

VI. Please describe how PCR (polymerase chain reaction) amplify targeted DNA. (5%)

VII. How the riboswitch at 5' UTR (untranslated region) controls the transcription of an operon? (5%)

VIII. What is "quorum sensing" of bacteria? Please give an example and describe. (4%)

IX. Please define the D (decimal reduction time) value. (2%)

Part B (50%)

I. In 2016, Yoshida et al published their discoveries on identification of a new bacterial species, *Ideonella sakaiensis*, which can use poly (ethylene terephthalate) (PET) as its energy and carbon sources. Unfortunately, the efficiency of its PETase, the key enzyme to break down PET, is not good enough. Pretend you're a scientist who is asked to improve the PET-degrading activity of *I. sakaiensis*. What will you do? Please list three techniques to optimize this bacterium for industrial purposes, and briefly explain the principle of each technique. (6%)

II. Please describe one feature which can be used to distinguish the microorganisms in each question. (6%)

- (1) nitrifying bacteria (2) Actinobacteria (3) Kingdom Protists (4) temperate bacteriophages (5) Class *Mollicutes* (6) mycorrhizal fungi

III. Below are some cases that basic researches in general microbiology can actually turn into very useful tools or techniques for studies in different fields. Please explain their original biological function(s) and how they are used in biotechnology nowadays. (8%)

- (1) Restriction enzymes (2) Crispr-Cas (3) luciferase (4) transfer DNA (T-DNA)

IV. The cells of *Clamydomonas* sp. contain a large cup-shape chloroplast, conspicuous pyrenoid, a stigma and two small contractile vacuoles at flagella base. Based on these features, please suggest an environment suitable for its growth and explain why? (4%)

題號： 305

國立臺灣大學 109 學年度碩士班招生考試試題

科目： 微生物學(A)

題號： 305

節次： 6

共 2 頁之第 2 頁

V. Please define the following terms in relation to microbial ecology. (12%)

(1) microbiota (2) metagenomics (3) culturomics (4) phylochip (5) viable but nonculturable (VBNC) (6) enrichment culture

VI. Fit the best answer (A-D) to each question below. (A) type I hypersensitivity (B) type II hypersensitivity (C) type III hypersensitivity (D) type IV hypersensitivity. (5%)

Questions:

(1) Erythroblastosis fetalis (2) Tuberculin hypersensitivity (3) involves surface-bound IgE on the mast cells (4) involves the formation of immune complex (5) Transplantation rejection

VII. The enzyme-linked immunosorbent assay (ELISA) is a widely used serological test for antibody or antigen detection. What are direct, indirect and sandwich ELISA?(6%) and what do these three methods detect for? (Antigen or antibody in a sample?) (3%)

試題隨卷繳回