

※ 考生請注意：本試題不可使用計算機

(1) Please define the terminology terms in Microbiology and indicate the possible relationships.

- (a) Nitrification and Anammox (6pts)**
- (b) Catabolism and Anabolism (6pts)**
- (c) Photolithoautotroph and Chemoorganoheterotroph (6pts)**
- (d) Transcription and Translation Processes in Genetics (6pts)**
- (e) Endoplasmic Reticulum and Golgi Body (6pts)**
- (f) Mitochondria and Chloroplast (6pts)**

(2) Many microorganisms are phototrophs that can carry out the photosynthesis for the synthesis of ATP. Please compare anoxygenic photosynthesis and oxygenic photosynthesis based on (a) the major type of microorganisms (4 pts), (b) pigment used to capture light energy (4 pts), and (c) type of electron donor (4 pts). (d) How do these two types of phototrophy differ from rhodopsin-based phototrophy (4 pts).

(3) A pure culture that only contains a single kind of microorganism can be obtained from enrichment cultures in many ways, such as the streak plate and liquid dilution methods. (a) Please describe how to combine these two methods to isolate a pure bacterial culture for degrading toluene aerobically from a toluene-contaminated soil sample (10 pts). (b) How do you confirm that the bacterial culture you obtain is "pure"? Please describe at least four criteria (8pts). (c) A real-time polymerase chain reaction technique can be used to quantify the bacterial strain in the soil sample. Please describe the working principle of quantification (10 pts).

(4) Starch is a carbohydrate consisting of a large number glucose molecule and is frequently used as an energy source for bacterial growth. Please try your best to describe how various microbial populations in sediment environment degrade starch and produce gaseous methane and carbon dioxide as final products (20 pts).