國立成功大學

113學年度碩士班招生考試試題

編　　號：139

系　　所：環境工程學系

科　　目：環境化學及環境微生物學

日　　期：0201

節　　次：第 2 節

備　　註：可使用計算機

1.(20%)Assuming a temperature of 25°C, estimate the degree to which tetrachloroethene (PCE) will be retarded in a groundwater aquifer with

(a) A void fraction of 0.30, a bulk density of 2000 kg/m³, and an organic carbon content of 0.25 percent.

(b) A void fraction of 0.30, a bulk density of 2000 kg/m³, and an organic carbon content of 1.0 percent.

(c) Based on your answer in (a) and (b), by what factor does increasing the organic carbon content by a factor of 4 increase the retardation?

2.(20%)The anaerobic biotransformation of chlorinated organics, such as chloroform, can be represented by a second-order rate expression. This expression is one-order with respect to the concentration of chlorinated organics and one-order with respect to the concentration of bacteria. This process is typically called *cometabolism*, and it is typically assumed that the concentration of bacteria remains constant. If the second-order rate coefficient is 0.005 L/mg-d and the concentration of bacteria is 100 mg/L, how many days will it take for an initial concentration of chloroform to be reduced to 10 μg/L (which represents a 99 percent reduction)?

3.(10%)How many milliliters of 1 N NaOH should be added to a 500 mL solution containing 500 mg of acetic acid to raise the pH to 5?

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

4. Please clearly define or explain the following terminology.

(a) Michaelis-Menten kinetics (5 pts)

(b) Anabolism and Metabolism (4 pts)

(c) Phytoremediation and Bioaugmentation (4 pts)

(d) Quorum sensing (5 pts)

(e) Glycolysis and Gluconeogenesis (6 pts)

5. Analysis of indicator microorganisms is the current practice to monitor the fecal contamination, ensuring the safety of drinking water. Traditionally, the indicator microorganisms are analyzed by the cultivation method with selective media.

(a) Which three of related bacterial groups are commonly used as indicator microorganisms for drinking water quality? (6 pts)

(b) Please describe one analytical procedure of the indicator microorganism in details. (5 pts)

(c) The indicator microbe can change the vegetative conditions to the VBNC state. What does "VBNC" mean? (5 pts)

(d) Please discuss the significance of VBNC state in the context of the analysis of indicator microbes. (10 pts)