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5% (1) Write the Nernst equation. (5%)

10% (2) How would you expect pE (i.e., electron activity) to vary (改變, 變化) with depth in the Feng-Shan Reservoir (鳳山水庫).

二、

5% (1) Write stoichiometric biochemical reactions of nitrification and denitrification (i.e., methanol is used as a carbon source), respectively.

10% (2) Based on the stoichiometry (i.e., molar relationship), calculate the alkalinity consumption and methanol consumption in nitrification and denitrification, respectively. Note: The results must be expressed in g alkalinity consumed/g NH_4^+ -N oxidized and g CH_3OH consumed/g NO_3^- -N reduced, respectively.

三、

7% (1) Derive the equation that can be used to calculate the Langelier's saturation index (L. I.).

3% (2) How to apply Langelier's saturation index in water and wastewater engineering?

四、

Explanation:

2% (1) thermodynamics

2% (2) kinetics

2% (3) Henry's law

2% (4) Beer's law

2% (5) LeChatelier principle

環境微生物學 部份

五. 解釋名詞: (15%)

1. co-metabolism
2. AMES test
3. Xenobiotic compound
4. growth curve
5. diauxic growth

六. 簡答題: (35%)

1. 請圖示說明碳、氮循環之示意圖，並列出各反應名稱及參與反應之微生物名稱。(10%)
2. 請列舉三種常用來檢測微生物生長活性之方法，並比較其優缺點。(5%)
3. 請以圖示詳細說明呼吸作用 (respiration) 及光合作用 (photosynthesis) 之完整流程及所需條件。(10%)
4. 何謂好氧 (aerobic) 及厭氧 (anaerobic) 生物處理？比較此兩系統廢水生物處理之生化反應程序之差異，參列主要微生物種類及其優缺點。(10%)