一、解釋名詞：每題2分 (10分)

1. AMES test

2. cometabolism

3. di-auxic growth

4. enzyme

5. xenobiotic compounds

二、問答題：每題10分 (40分)

1. 何謂生物能量變化三部曲？請以生物化學物質能轉換之觀點，分別敘述其過程及所需條件。

2. 列表比較 photo-, chemo-autotrophic 及 chemoheterophic 微生物利用碳、氮及能量之異同義，並各舉一代表菌說明其在環境中所扮演之角色。

3. 比較好氧(aerobic)於厭氧(anaerobic)生物處理污水之處理程序、主要發生菌種類及優缺義。

4. 何謂微生物生長？如何表示？在一密閉系統中，微生物之生長曲線有其一定方式，請繪圖表示，並說明之。並列舉三種較為常用表示微生物生長之測定方法。

三、(6%) Theoretically, explain why total alkalinity tends to decrease as temperature of water has been increased to the boiling point.

四、(10%) Write at least five stoichiometric chemical equations about the reactions between chlorine and <u>impurities</u> (such as ammonia, other reducing materials) in water.

五、(10%) Theoretically, how the electrochemical reaction occurs in a corrosive cast-iron pipe in the water distribution system?

六、(12%) To prepare 10^{-2} M HCO_3^-–CO_3^{2-} buffer with a pH value of 10, calculate how many grams of $NaHCO_3$ and Na_2CO_3 have to be dissolved into 1 liter of deionized water. (Given: $HCO_3^- \rightarrow CO_3^{2-} + H^+$; $pK_{a2} = 10.3$; Atomic weight Na = 23, C = 12, O = 16, H = 1)

七、(12%) Two mole of an ideal gas at 50°C and 1 atm pressure is mixed adiabatically (i.e., no heat loss) with one mole of a different gas at 80°C and 1 atm pressure to yield a mixture whose pressure is also 1 atm. If C_p for each gas is 2.5 R cal/mol-deg, calculate entropy change (ΔS) for the process.