

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

1. Give the chemical structure of the following chemicals. (20%, 4% for each)
 - a. hexabromocyclododecanes (HBCD)
 - b. Di(ethyl hexyl)phthalate (DEHP)
 - c. Ractopamine
 - d. Nonyl Phenol
 - e. 3,3',4,4',5,5'-Hexa Chlorinated Biphenyls
2. Please describe the nitrogen cycle in the ecosystem and describe the role of organism in the nitrogen cycle. (15%)
3. Balance the following equations: (20%, 4% for each)
 - a. $\text{MnO}_2 + \text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{MnSO}_4 + \text{H}_2\text{O} + \text{Cl}_2 + \text{Na}_2\text{SO}_4$
 - b. $\text{FeSO}_4 + \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + \text{Cr}_2(\text{SO}_4)_3 + \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$
 - c. $\text{Al}_2(\text{SO}_4)_3 \cdot 14 \text{H}_2\text{O} + \text{Ca}(\text{HCO}_3)_2 \rightarrow \text{Al}(\text{OH})_3 + \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$
 - d. $\text{HClO} \rightarrow \text{HClO}_3 + \text{HCl}$
 - e. $\text{H}_2\text{C}_2\text{O}_4 + \text{KMnO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + \text{MnSO}_4 + \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$
4. Ozone depletion (OD) is originated from the chemical destruction of the stratospheric ozone layer beyond natural reactions where stratospheric ozone is constantly being created and destroyed through natural cycles. Nowadays, OD has become an important issue globally. Please answer the following questions related to OD.
 - a. Please explain why we care about the OD? (3%)
 - b. How does ozone depletion occur (specific reaction mechanism is preferred)? (6%)
 - c. How do we know that natural sources are not responsible for ozone depletion? (3%)
 - d. Will the ozone layer recover? Can we make more ozone to fill in the hole? (3%)
5. The incineration becomes a principal method for treatment of municipal solid waste in Taiwan. Please use reactive equation to describe the formation mechanisms of dioxins during the combustion of municipal solid waste. (15%)
6. What evidences had been stemmed to confirm that iron and manganese gain entrance to water supplies through changes produced in environmental conditions as results of biological reactions? (15%)