

※ 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 and describe the usage of the following chemicals in the industry. (20%, 4% for each)
  - (1) Endosulfan
  - (2) Short chain chlorinated paraffins (SCCPs)
  - (3) Bisphenol A
  - (4) 3,3',4,4',5,5'-Hexa brominated biphenyls (PBBs)
  - (5) Vinyl acetate
  
2. 由於大量燃燒化石燃料而使得大氣中  $\text{CO}_2$  濃度節節上升，大氣中  $\text{CO}_2$  濃度與酸雨之形成有關，若在一大氣壓， $25^\circ\text{C}$  下，大氣中  $\text{CO}_2$  濃度上升至 400 ppm 時，若其溶於水中達平衡狀態下，請計算平衡時水中之 pH 值。(20%)
  - (1) 一大氣壓， $25^\circ\text{C}$  下， $\text{CO}_2$  溶水之亨利常數  $H=3.4 \times 10^{-2}$   $\left(\frac{\text{mole}}{\text{L} \times \text{atm}}\right)$
  - (2)  $\text{H}_2\text{CO}_3 \rightleftharpoons \text{H}^+ + \text{HCO}_3^-$   $K_{\text{C1}}=2.33 \times 10^{-8}$
  - (3)  $\text{HCO}_3^- \rightleftharpoons \text{H}^+ + \text{CO}_3^{2-}$   $K_{\text{C2}}=2.13 \times 10^{-4}$
  
3. Balance the following equations: (20%, 4% for each)
  - (1) Oxidation of  $\text{I}^-$  to  $\text{I}_2$  and reduction of  $\text{MnO}_2$  to  $\text{Mn}^{2+}$
  - (2) Oxidation of  $\text{S}_2\text{O}_3^{2-}$  to  $\text{SO}_4^{2-}$  and reduction of  $\text{Cl}_2$  to  $\text{Cl}^-$
  - (3) Oxidation of  $\text{NH}_4^+$  to  $\text{NO}_3^-$  and reduction of  $\text{O}_2$  to  $\text{H}_2\text{O}$
  - (4) Oxidation of  $\text{CH}_3\text{COO}^-$  to  $\text{CO}_2$  and reduction of  $\text{Cr}_2\text{O}_7^{2-}$  to  $\text{Cr}^{3+}$
  - (5) Oxidation of  $\text{C}_6\text{H}_{12}\text{O}_6$  to  $\text{CO}_2$  and reduction of  $\text{NO}_3^-$  to  $\text{N}_2$
  
4. Please explain why the results of BOD and COD for the same sample are always different? (10%)
  
5. Please describe the formation mechanism of primary and secondary  $\text{PM}_{2.5}$ ? (20%)
  
6. Please explain the formation mechanism of "Crown corrosion" in the public sewage system? (10%)