

國立清華大學 命題紙

98 學年度 奈米工程與微系統研究所 碩士班入學考試

科目 化學 科目代碼 ~~1085~~ 共 1 頁 第 1 頁 * 請在【答案卷卡】內作答
1825

1. Arrange the following bonds in order of increasing energy. (15%)
 - (A) $\text{N}\equiv\text{N}$, $\text{C}\equiv\text{C}$, $\text{C}\equiv\text{N}$, $\text{C}=\text{C}$, $\text{N}=\text{N}$
 - (B) $\text{H}-\text{H}$, $\text{Si}-\text{Si}$, $\text{S}-\text{S}$, $\text{O}-\text{O}$, $\text{Si}-\text{O}$
 - (C) carbon-oxygen bond in CO , CO_2 , CO_3^{2-} , CH_3OH
2. What will occur when carbon tetrachloride (CCl_4) or silicon tetrachloride (SiCl_4) is added to water, individually? Explain the difference in terms of reactivity. (15%)
3. Increasing Global warming due to green house gases (GHG) is threatening the sustainable development of human beings. Please briefly explain GHG, natural and anthropogenic sources, and mitigation means. (15%)
4. Air, O_2 , N_2 , H_2 , CH_4 , and He are among the mostly used gases in laboratory. Please briefly describe their characteristic properties and cautions for implementation and usage. (10%)
5. Design a classis scheme of qualitative analysis of a mixture solution containing Ag^+ , Hg_2^{2+} , and Pb^{2+} ions. (10%)
6. The reaction of the formation of gaseous hydrogen fluoride from hydrogen and fluorine has an equilibrium constant of 1.15×10^2 at a certain temperature. In a particular experiment at this temperature 3.000 mol of each component were added to a 1.500-L flask. Calculate the equilibrium concentrations of all species. (10%)
7. At 25°C , the solubility of benzoic acid $\text{C}_6\text{H}_5\text{-COOH}$ is 0.34 g/100mL in water, and 10.00 g/100mL in benzene. Briefly explain the difference in solubility behavior. In order to increase its solubility in water, should a more basic or acidic aqueous solution being used? Justify your answer. (15%)
8. Balance the following reactions: (10%)
 - (A) $\text{Cu}(s) + \text{HNO}_3(aq) \rightarrow \text{Cu}^{2+}(aq) + \text{NO}(g)$
 - (B) $\text{Cl}_2(g) \rightarrow \text{Cl}^-(aq) + \text{ClO}^-(aq)$