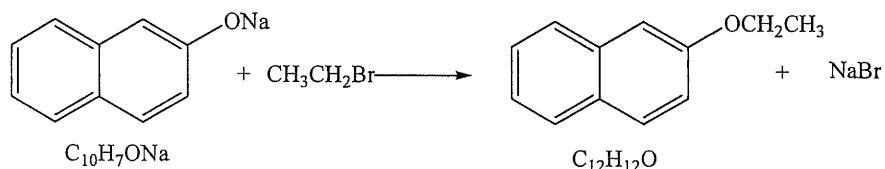科目：基礎化學　　　　　　　　系所組：化學系碩士班乙組

1. Give the common name of the following compounds. (a) $LiClO_4$ (b) $(NH_4)_2SO_4$ (c) H_2CO_3 (d) CH_3CH_2OH (e) TiO_2. (10 %)

2. The production of 2-ethoxynaphthalene ($C_{12}H_{12}O$), an additive used to enhance the odors of perfumes, is completed by the following reaction.

If 3.52 g sodium naphthalate ($C_{10}H_7ONa$) is converted to 3.44 g 2-ethoxynaphthalene, what is the percent yield (assuming that there is an excess of bromoethane)? (10 %)

3. A 10.0-mL sample of an aqueous solution of calcium hydroxide is neutralized by 25.0 mL of 0.0200 M HNO_3(aq). What is the molarity of the calcium hydroxide solution? (10 %)

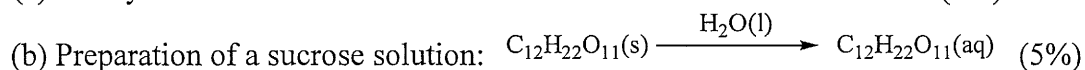4. Give the electron configurations for the following ions, using *spdf* notation. (a) Al^{3+} (b) Cu^+ (c) Fe^{3+} (d) Br^- (e) S^{2-}. (10%)

5. Write Lewis structures for the following compounds; indicate the hybrid orbitals about each central atom. (a) SO_3 (b) SF_2 (c) H_2O (d) CO_2 (e) XeF_4. (10 %)

6. For the body-centered cubic (BBC) crystal structure that the unit cell edge length a and the atomic radius R. Please show the relationship between a and R. (5%) How many atoms belong to the unit cell? (5%)

7. Calculate the pH and pOH of 0.500 M $NH_{3(aq)}$, given that K_b for ammonia is 1.8×10^{-5}. (10 %)

8. Predict whether each of the following leads to an increase or decrease in the entropy of a system. Explain why. (a) The synthesis of ammonia: $N_2(g) + 3 H_2(g) \longrightarrow 2 NH_3(g)$ (5%)

    (b) Preparation of a sucrose solution: $C_{12}H_{22}O_{11}(s) \xrightarrow{H_2O(l)} C_{12}H_{22}O_{11}(aq)$ (5%)

9. In basic solution, Br_2 disproportionates to bromide ions and bromate ions. Use the half-reaction method to balance the equation for this reaction: $Br_2(l) \longrightarrow Br^-(aq) + BrO_3^-(aq)$ (10 %)

10. What are the coordination number and the oxidation number of the central atom in (a) $[CoCl_4(NH_3)_2]^-$ and (b) $[Ni(CO)_4]$? (10 %)

※ 注意：1.考生須在「彌封答案卷」上作答。
　　　　　2.本試題紙空白部分可當稿紙使用。
　　　　　3.考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。