

國立嘉義大學九十三年學年度

應用化學系碩士班招生考試 (甲組) 試題

科目：綜合化學 I

一、無機化學 (50%)

1. Write down the element symbols according to the periodic table for the first row of transition metals from atomic number 21 (Scandium) to atomic number 30 (Zinc). (10%)

2. Calculate the spin-only moment μ_s for the following atoms and ion. (10%)

(a) Fe (b) Fe^{2+} (c) Cu (d) Cr

3. Based on the Ligand Field Theory, consider metal-to-ligand ($M \rightarrow L$) bonding and ligand-to-metal back-bonding ($L \rightarrow M$) two cases; (10%)

- (a) which case is a π acceptor?
 (b) after d orbital energy level splitting, which case has a lower t_{2g} (ligand) orbitals?
 (c) which one will leave the central metal ion with a large negative charge?
 (d) which case favors low-spin configuration?
 (e) which type bonding will increase stability for complex?

4. Determine Term Symbol and Ligand Field Stable Energy (LFSE) for the following compounds: (10%)

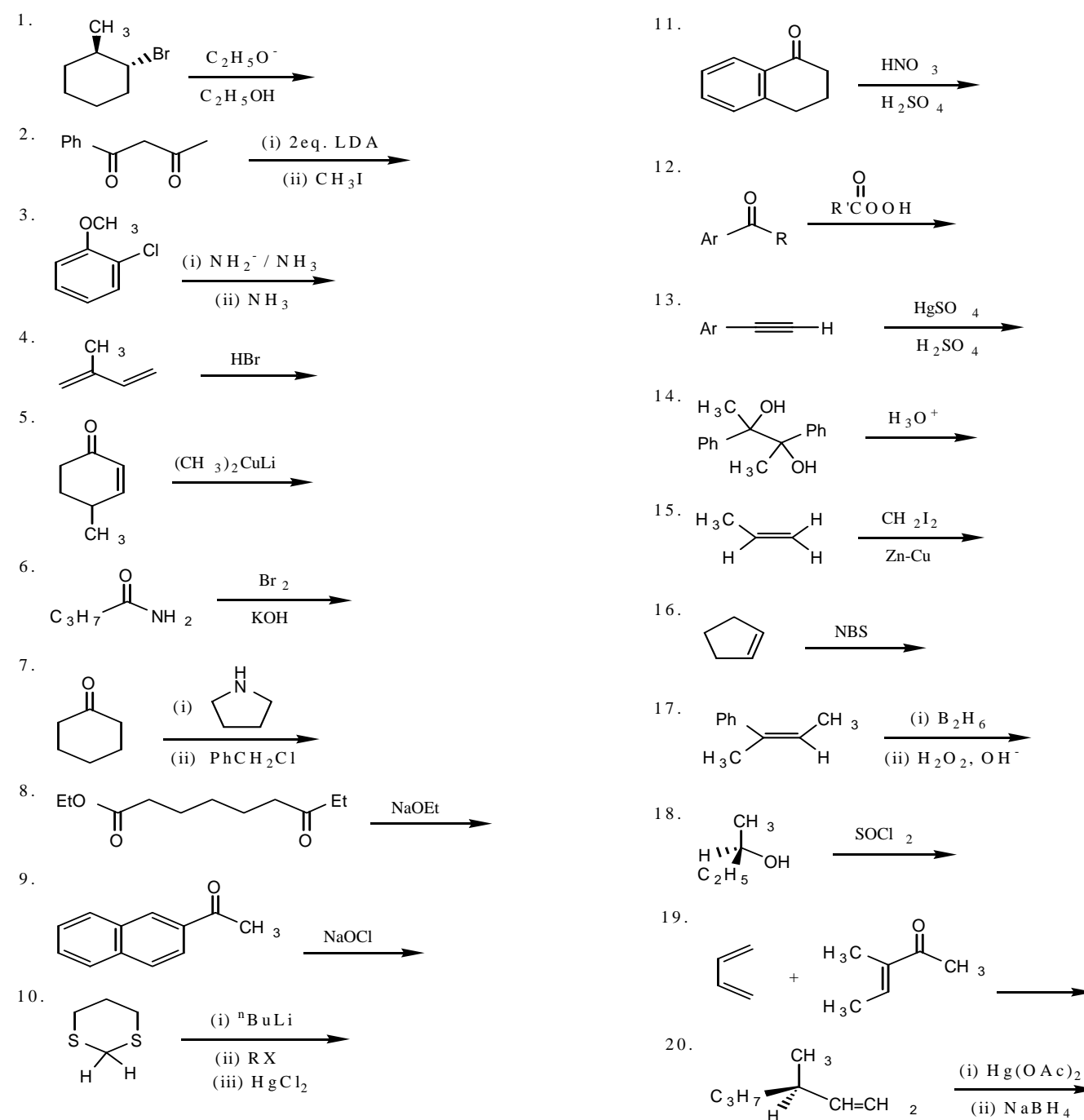
Term Symbol LFSE (Δ_0)

- (a) $[\text{Co}(\text{CO})_4]^-$
 (b) $[\text{Cr}(\text{CN})_6]^{4-}$
 (c) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
 (d) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$

5. OCN^- has three possible structures, $\text{O}=\text{C}=\text{N}^-$, $\text{O}-\text{C}\equiv\text{N}^-$, $\text{O}^-\text{C}\equiv\text{N}$, (a) determine the formal charge for O and N in each structure (b) predict which structure is the most important (reasonable) one? (10%)

二、有機化學 (50%)

I. Please complete the following reactions: (2 points each, 40 points total)



III. Propose a reasonable structure and assign all proton signals as far as you can. (10%)

