

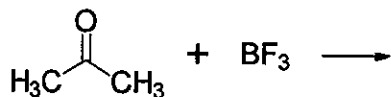
※ 注意：請於答案卷上依序作答，並應註明作答之大題及其題號。

1. Please name the following groups in English; (a) $-\text{OH}$, (b) $-\text{CO}_2\text{H}$, (c) $-\text{NO}_2$, (d) $-\text{Br}$, and (e) $-\text{C}_6\text{H}_5$. (10 points)

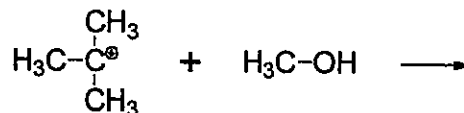
2. Please give a representative structure for each of the following species or groups; (a) β -lactam, (b) acetal, (c) Schiff base, (d) isoprene unit, and (e) enol. (10 points)

3. Complete the following Lewis acid-base reactions. Show all electron pairs on the reacting atoms and use curved arrows to show the flow of electrons in the reaction. (8 points)

(a)

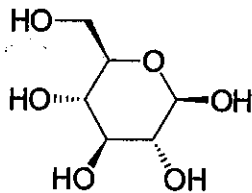


(b)

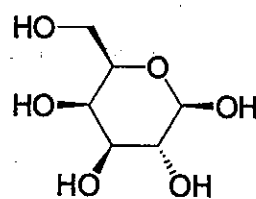


4. Please draw two chair conformations for each of the following compounds. Indicate which one is more stable in each pair of the chair conformations. (8 points)

(a)



(b)

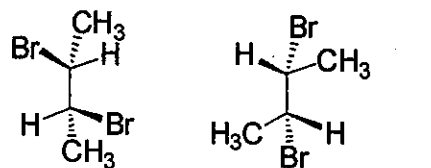


5. Indicate the relationship of the compounds in each pair. (8 points)

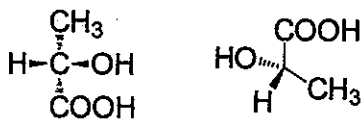
(a)



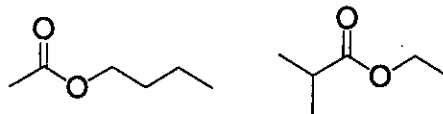
(b)



(c)

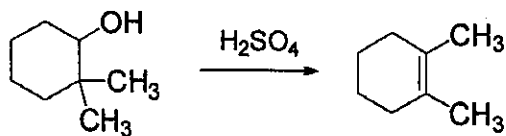


(d)

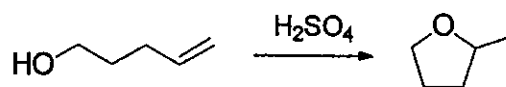


6. Provide a mechanism for the following reactions. (12 points)

(a)

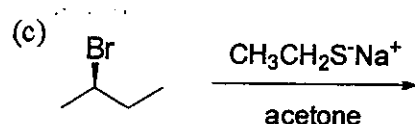
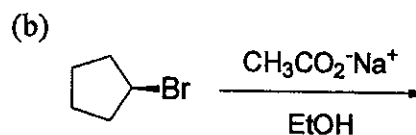
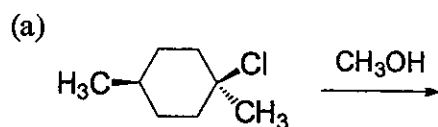


(b)



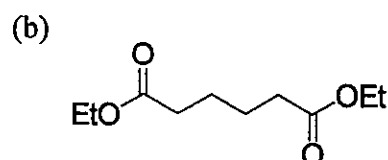
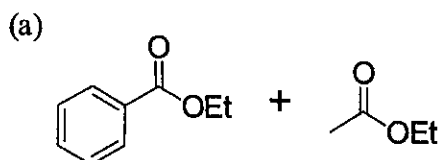
7. Draw a structural formula for the compound formed by treating 1-butanol with each of the following reagents; (a) Na metal, (b) SOCl_2 , and (c) PCC. (6 points)

8. Complete the following nucleophilic substitution reactions. (6 points)



9. Draw a structural formula for the compound formed by treating toluene ($\text{C}_6\text{H}_5\text{CH}_3$) with each of the following combinations of reagents; (a) $\text{HNO}_3/\text{H}_2\text{SO}_4$, (b) $\text{CH}_3\text{COCl}/\text{AlCl}_3$, (c) H_2CrO_4 , and (d) $\text{Br}_2/\text{FeBr}_3$. (8 points)

10. Each set of compounds undergoes (i) Claisen condensation, (ii) saponification followed by acidification, and (iii) thermal decarboxylation. Draw a structural formula of the product formed at each stage. (12 points)



11. Draw a structural formula for the compound formed in the following reactions. (12 points)

