

銘傳大學 96 學年度研究所碩士班招生考試
生物科技學系碩士班
第二節

有機化學試題

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(限用答案本作答)

- Write structural formulas for each of the following: (2 pts for each answer)
 - An ether with the formula C_3H_8O
 - An aldehyde with the formula C_4H_8O
 - An amide of ammonia with the formula C_4H_9NO
 - A secondary alcohol with the formula C_3H_8O
 - A primary amine with the formula $C_4H_{11}N$
- Acid HA has a $pK_a=20$; acid HB has a $pK_a=10$. (10 pts)
 - Which is the stronger acid?
 - Will an acid-base reaction with an equilibrium lying to the right take place if Na^+A^- is added to HB? Explain your answer.
- Acid-catalyzed dehydration of neopentyl alcohol, $(CH_3)_3CCH_2OH$, yields 2-methyl-2-butene as the major product. Outline a mechanism showing all steps in its formation. (10 pts)
- Write a mechanism that explains the formation of tetrahydrofuran (THF) from the reaction of 4-chloro-1-butanol and aqueous sodium hydroxide. (10 pts)
- What products would you expect from the following concerted cycloaddition reaction? (Give stereochemical formulas, 10 pts)
 - cis-2-Butene + $h\nu \rightarrow ?$
 - trans-2-Butene + $h\nu \rightarrow ?$
- Arbutin**, a compound that can be isolated from the leaves of cranberry, mulberry, and pear trees, has the molecular formula $C_{12}H_{16}O_7$. When arbutin is treated with aqueous acid or with a β -glucosidase, the reaction produces D-glucose and a compound X with the molecular formula $C_6H_6O_2$. The 1H NMR spectrum of compound X consists of two singlets, one at δ 6.8 (4H) and one at δ 7.9 (2H). Methylation of arbutin followed by acidic hydrolysis yields 2,3,4,6-tetra-O-methyl-D-glucose and a compound Y ($C_7H_8O_2$). Compound Y is soluble in dilute aqueous NaOH but is insoluble in aqueous $NaHCO_3$. The 1H NMR spectrum of compound Y shows a singlet at δ 3.9 (3H), a singlet at δ 4.8 (1H), and a multiplet at δ 6.8 (4H). Treating compound Y with aqueous NaOH and $(CH_3)_2SO_4$ produces compound Z ($C_8H_{10}O_2$). The 1H NMR spectrum of compound Z consists of two singlets, one at δ 3.75 (6H) and one at δ 6.8 (4H). Propose structures for arbutin and for compounds X, Y, and Z. (50 pts)

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