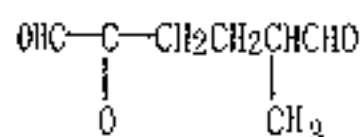


八十四學年度 化學工程研究所 乙 組碩士班研究生入學考試

科目 有機化學 科號 1702 共 3 頁第 1 頁 *請在試卷【答案卷】內作答

Problem 1 (15%)

An unknown hydrocarbon has the formula $C_{10}H_{16}$. It absorbs 2 mol of hydrogen on catalytic hydrogenation. Upon reaction with 1 mol of HCl, two different monochlorides ($C_{10}H_{17}Cl$) are obtained. The hydrocarbon does not react with maleic anhydride in a Diels-Alder reaction. Treatment with excess ozone, followed by Zn and H_2O , gives acetone and



What is the structure of the hydrocarbon and why does it not undergo a Diels-Alder reaction?

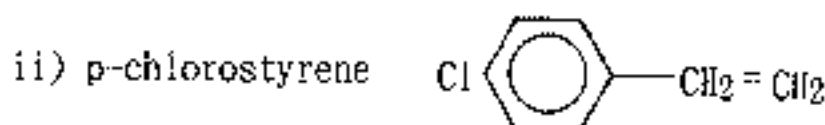
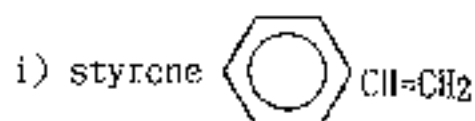
Problem 2 (15%)

Show the chemical reactions in the preparation of methyl methacrylate [$\text{CH}_2=\text{C}(\text{CH}_3)\text{COOCH}_3$] from acetone and HCN. Other reagents may be used as required.

Problem 3 (20%)

10% (a) Please describe the Grignard synthesis for preparations of primary alcohol, secondary alcohol and tertiary alcohol.

10% (b) Please describe the routes for preparations of



Starting from benzene and other proper chemicals.

Problem 4 (20%)

(a) The S_N2 reaction of sodium phenoxide (C_6H_5ONa) and allyl bromide ($\text{CH}_2=\text{CH}-\text{CH}_2\text{Br}$) was carried out in an organic solvent. The experimental data indicated that the reaction rate is decreased with the polarity of the organic solvent. Explain why.

(b) Write out the possible products obtained from the primary reaction and secondary reaction, respectively, by reacting sodium phenoxide (C_6H_5ONa) and allyl chloride ($\text{CH}_2=\text{CH}-\text{CH}_2\text{Cl}$) in an organic homogeneous solution.

八十四學年度 化學工程研究所 乙 組碩士班研究生入學考試

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- (c) State the Williamson synthesis. Write out its important reaction steps. Suggest two reactants to synthesize ethyl tert-butyl ether by the Williamson synthesis.
- (d) In the reaction of methylbenzyl bromide and sodium phenoxide in chlorobenzene, how do you predict the relative reactivities of the o-methylbenzyl bromide, m-methylbenzyl bromide and p-methylbenzyl bromide?

Problem 5 (10%)

試以正壬烷(n-nonane, C_9H_{20}) 爲例, 說明由輕油裂解(Naphtha Cracking) 製造乙烯的反應機構, 並討論壓力與溫度對乙烯產率的影響。

Problem 6 (10%)

回答下列問題:

- (1) 酚(phenol)與乙醇(ethanol)比較, 何者具有較高酸性並說明其理由。
- (2) 對-硝基酚(p-nitrophenol)與鄰-硝基酚(o-nitrophenol)比較, 何者具有較高沸點, 並說明其理由。
- (3) 順-4-甲基環己醇(cis-4-methylcyclohexanol)及反-4-甲基環己醇(trans-4-methylcyclohexanol)比較, 何者具有較高安定性, 並說明其理由。
- (4) 順-丁烯二酸(maleic acid)與反-丁烯二酸(fumaric acid)比較, 何者具有較高熔點, 何者具有較高在水中的溶解度, 並說明其理由。

Problem 7 (10%)

請由下列 MS, NMR, IR及UV光譜圖推測此化合物的結構式, 並說明理由。

八十四學年度 化學工程研究所 乙 組碩士班研究生入學者試

科目 有機化學 科號 1702 共 3 頁第 3 頁 *請在試卷【答案卷】內作答

