系所組別：化學工程學系乙組

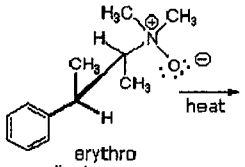
考試科目：有機化學　　考試日期：0223，節次：1

※ 考生請注意：本試題不可使用計算機

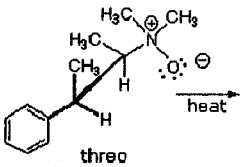
Organic Chemistry

(1) Oxidation of a primary alcohol to an aldehyde usually gives some over-oxidation to the carboxylic acid. Assume you have used PCC to oxidize 1-pentanol to pentanal. (a) Show how you would use acid-base extraction to purify the pentanal. (b) Which of the expected impurities cannot be removed from pentanal be acid-base extractions? How would you remove this impurity? (10 pts)

(2) Give the product of the following reactions, and propose mechanisms for your answers: (10 pts)

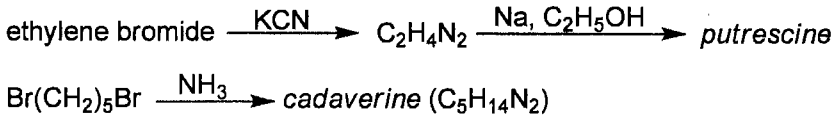


erythro diastereomer

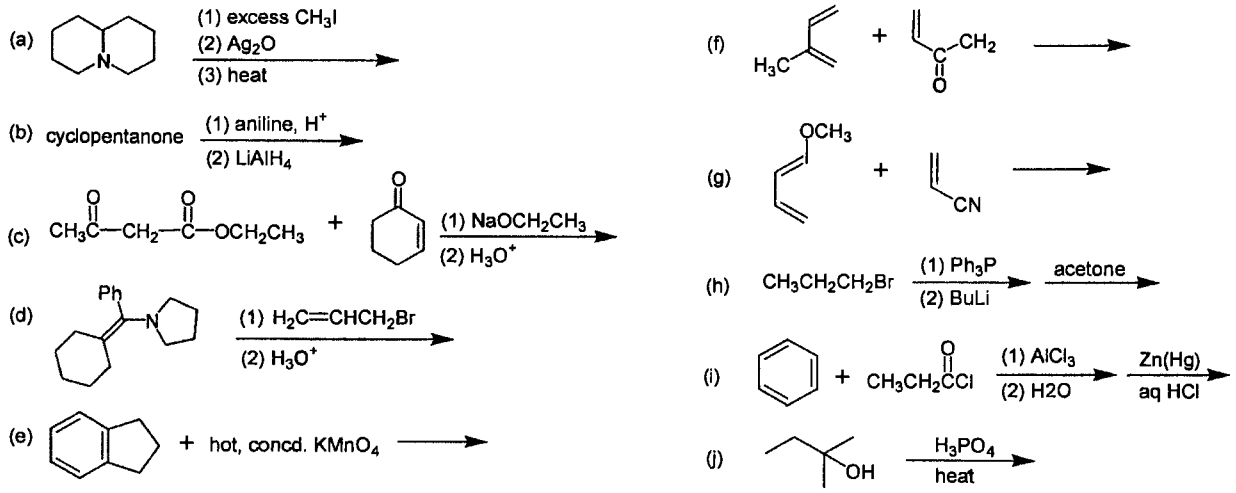


threo diastereomer

(3) On the basis of the following synthesis, give the structures of *putrescine* and *cadaverine*, which are found in rotting fish. (10 pts)



(4) Give the major products of the following reactions. (10 pts)



(5) A naïve student needed a quantity of benzhydral, $(C_6H_5)_2CHOH$, and decided to prepare it by the reaction between phenylmagnesium bromide and benzaldehyle. He prepared a mole of the Grignard reagent. To insure a good yield, he then added, not one, but two moles of the aldehyde. On working up the reaction mixture, he was at first gratified to find he had obtained a good yield of a crystalline produce, but his hopes were dashed when closer examination revealed that he had made, not benzhydrol, but the ketone benzphenone. Bewildered, the student made the first of many trips to his research director's office. He returned shortly, red-faced, to the laboratory, carried out the reaction again using equimolar amounts of the reactants, and obtained a good yield of the compound he wanted. What had gone wrong in his first attempt? How had his generosity with benzaldehyde betrayed him? (10 pts)

(背面仍有題目,請繼續作答)

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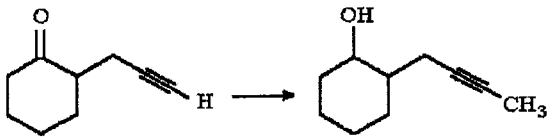
(6) Give the mechanisms for the base-catalyzed and acid-catalyzed tautomerism. (10pts)

(7) Propose a sequence of steps to carry out the following conversion. (10 pts)



(8) Methyl α–cyanoacrylate (Super Glue) is easily polymerized, even by weak base. Draw a mechanism for its base-catalyzed polymerization, and explain why this polymerization goes so quickly and easily.

(9) When anthracene is added to the reaction of chlorobezene with concentrated NaOH at 350°C, an interesting Diels-Alder aduct of formula $C_{20}H_{14}$ results. The proton NMR spectrum of the product shows a singlet of area 2 around δ = 3 ppm and a broad singlet of area of 12 around δ = 7 ppm. Propose a structure for the product, and explain why one of the aromatic rings od anthracene reacted as a diene. (10 pts)

(10) A compound ($C_{10}H_{12}O_2$) whose ^{1}H-NMR spectrum is shown below was isolated from a reaction mixture containing 2phenolethanol and acetic acid. (a) Propose a structure of this compound. (b) Assign peaks to show which protons give rise to which signals in the spectrum. (10 pts)