

Faculteit der Natuurwetenschappen, Wiskunde en Informatica

Tentamen

Organic Chemistry Bachelor Scheikunde (joint degree)

Datum: -

Tijd: -uur

Aantal pagina's: 4 (inclusief voorblad)

Aantal open vragen: 8

Bij iedere vraag staat het maximaal te behalen aantal punten vermeld. Totaal aantal te behalen punten: 103

VOORDAT U BEGINT

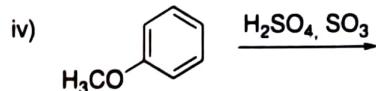
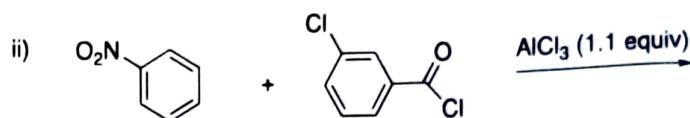
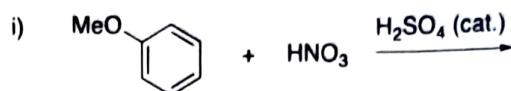
- Controleer of uw versie van het tentamen compleet is.
- Schrijf uw naam en studentnummer en indien van toepassing versienummer op elk vel papier dat u inlevert en nummer de pagina's.
- Uw mobiele telefoon moet uit staan en in uw jas of tas zitten. Uw jas en tas moeten op de grond liggen.
- **Toegestane hulpmiddelen:** Scrap paper. Overige hulpmiddelen zijn niet toegestaan.

HUISHOUDELIJKE MEDEDELINGEN

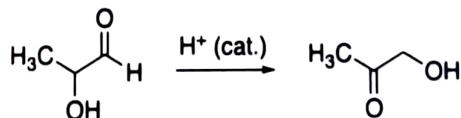
- De eerste 30 minuten en de laatste 15 minuten mag u de zaal niet verlaten, ook niet voor het bezoeken van het toilet.
- 15 minuten voor het eind wordt u gewaarschuwd dat het inlevertijdstip nadert.
- Vul na afloop van het tentamen het evaluatieformulier in, indien van toepassing.
- U bent verplicht zich op verzoek van de examinator (of diens vertegenwoordiger) te kunnen legitimeren met een bewijs van inschrijving en een geldig legitimatiebewijs.
- Tijdens het tentamen is toiletbezoek niet toegestaan, tenzij de surveillant hier toestemming voor geeft.
- Na afloop mag u dit tentamen meenemen.

Succes!

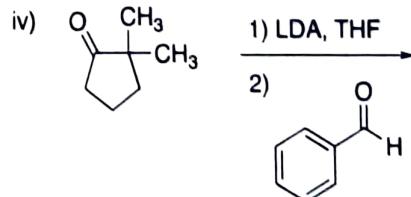
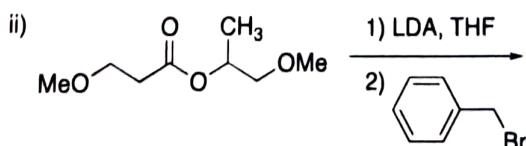
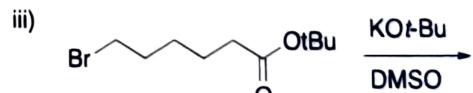
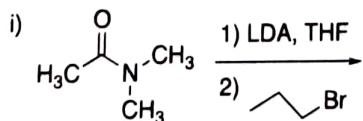
1. (16 pts) Please consider the four electrophilic aromatic substitution reactions drawn below.
- (4 x 2 = 8 pts) Draw the product of each reaction.
 - (8 pts) Draw the full mechanism of the first reaction (i) showing how the electrophilic species is formed but also the origin of the regioselectivity.



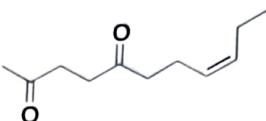
2. (10 pts) Only two name reactions were developed by Dutch organic chemists. The Lobry de Bruyn–Van Ekenstein transformation, drawn below, was the first. By the way, Lobry de Bruyn held the first chair in Organic Chemistry at the University of Amsterdam in 1894! Give a plausible mechanism for this rearrangement.



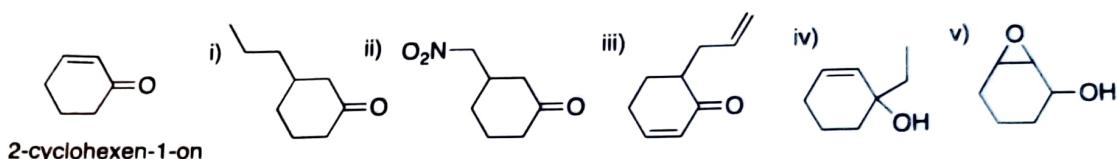
3. (16 pts) Give the main product of the four reactions drawn below. (LDA = lithiumdiisopropylamide, THF and DMSO are solvents).



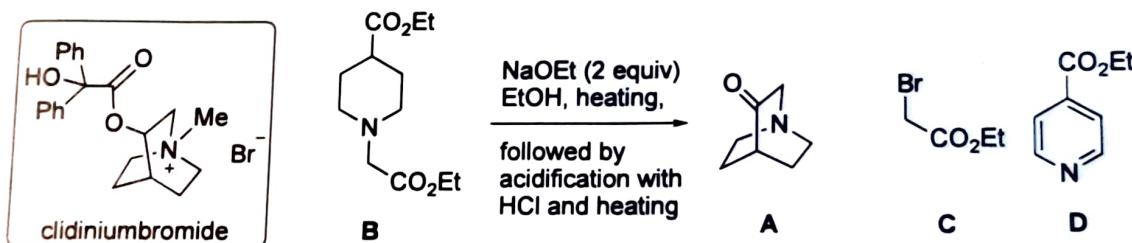
4. (2 x 6 = 12 pts) Ring-closing reactions are very common in organic synthesis. The two dicarbonyl compounds drawn below are treated with sodium methoxide (NaOMe) in MeOH as the solvent to give a cyclisation reaction. Give a short mechanistic reasoning for the formation of the main product. Also explain how much (catalytic or an excess) of sodium methoxide is needed to allow the reaction to reach completion.



5. (10 ptn) Show how 2-cyclohexen-1-on can be transformed in the products i-v drawn below. Possibly, more than one step is required.

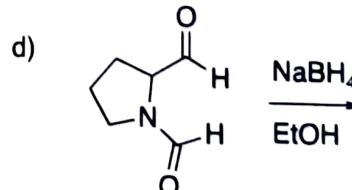
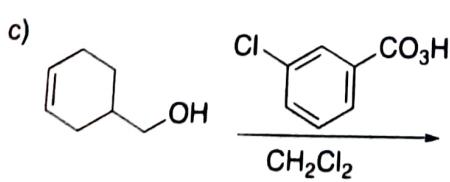
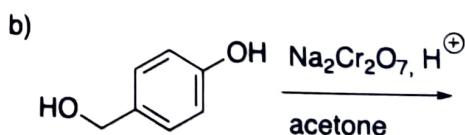
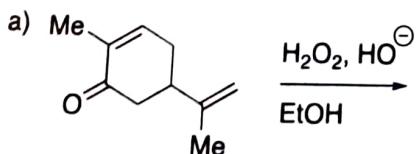


6. (15 pts) The synthesis of the gastric acid inhibitor clidinium bromide is characterised by the interesting bridged intermediate **A**. As depicted, compound **B** was made from diester **B**.



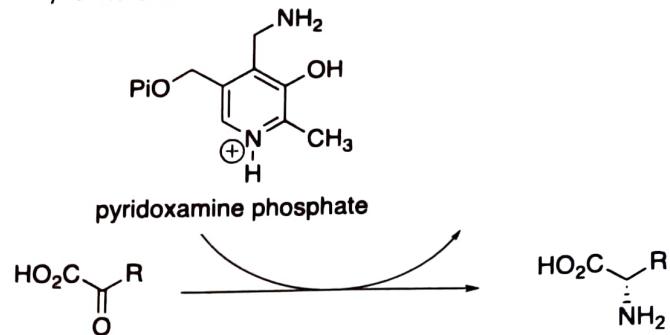
a) (10 pts) Draw the structure of intermediate towards **A** (before acidification) and show how (mechanism) this intermediate, after acidification and heating, provides **A**.
 b) (5 pts) Show the steps that are required to make **B** starting from **C** and **D**. Also draw the structure of the intermediate and the required reagents.

7. (12 pts) Many redox reactions show a high chemoselectivity. Draw the main product of each of the reactions shown below (the solvent is shown under the reaction arrow).

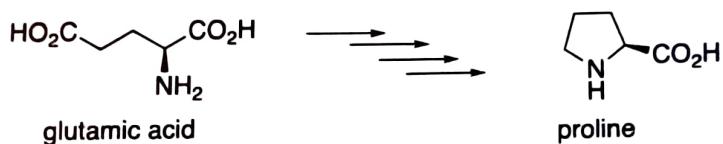


8. (only new curriculum students) (12 pts)

a) (6 pts) Cofactor pyridoxamine phosphate plays an important role in the enantioselective formation of L-amino acids from α -keto acids. Show the reaction mechanism and point out in which step the chirality is introduced.

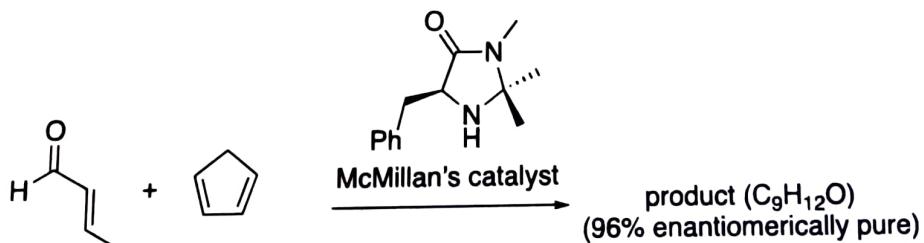


b) (6 pts) The biosynthesis of proline starts from glutamic acid. The sequence of events requires one molecule of ATP and two molecules of NAD(P)H. Draw the four intermediates of the biosynthesis (which is one carboxyl group activation step, a reduction, a condensation and a final reduction step).



8. (only old curriculum students) (12 pts)

a) (6 pts) David McMillan received the Nobel Prize Chemistry in 2021 for the topic of 'organocatalysis'. Give the product of the reaction below and show how McMillan's catalyst speeds up the reaction (the stereochemistry is unimportant).



b) (6 pts) To carry out the Diels-Alder reaction drawn below the starting material first has to be converted into the diene. Draw the structure and reaction conditions to make the required diene.

