Course 343 Instructor Hackenberger
Day Monday Date 11/4/13
Notes Taken By Guenette Total # of Pages 5

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PLEASE COMPLETE NOTES IN INK AND DO NOT STAPLE.

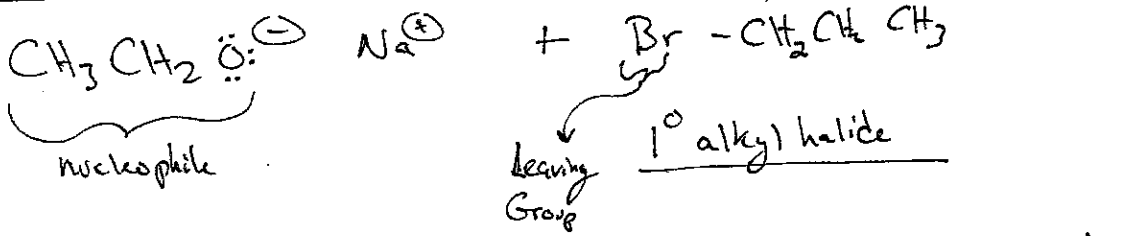
Exam #2 Average: 68

84-100	doing well	Regrade requests (w/ form from webpage) until Fri, 8th hr. after class
70-83	solid	
48-69	concern	
<47	trouble	

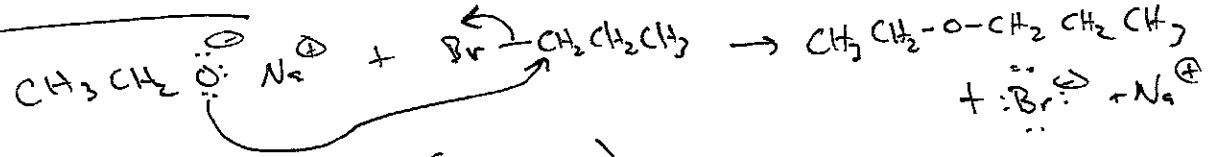
Chapter 9 : Substitution and Elimination Rxns of alkyl halides (rxns that occur @ sp^3 C's)

Problems: 1-5, 8-18, 20-74

Substitution reactions:



Mechanism



! Bond formation (C-O bond) and C-Br cleavage occur simultaneously

Course 343 Instructor Hackenbergen

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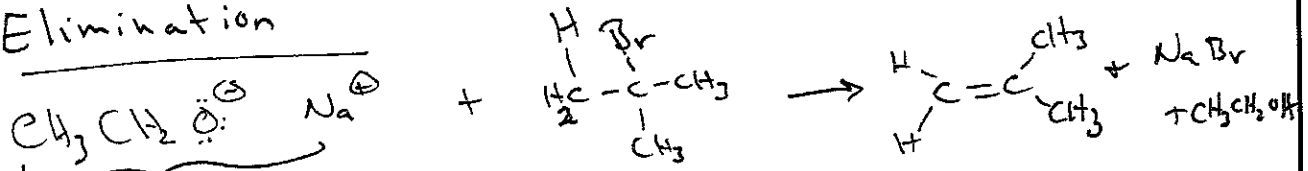
Elimination



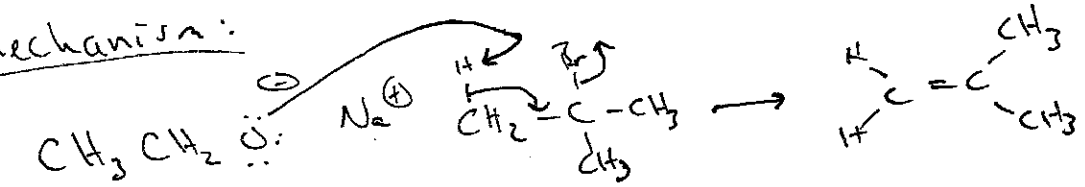
alkoxide → Bronsted Base

is no longer a nucleophile on the carbon it is 3°

3° alkyl halide

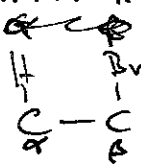
HBr is eliminated from the 3° alkyl halide

Mechanism:



double bond formed using C–H e⊖

β-elimination → another name for this rxn



Br is β to the α carbon

Substitution

nucleophile

1°

Elimination

Bronsted Base

3°

$CH_3CH_2O^{\ominus}$

alkyl halide

Course 343 Instructor Haekenberger
Day Monday Date 11/4/13
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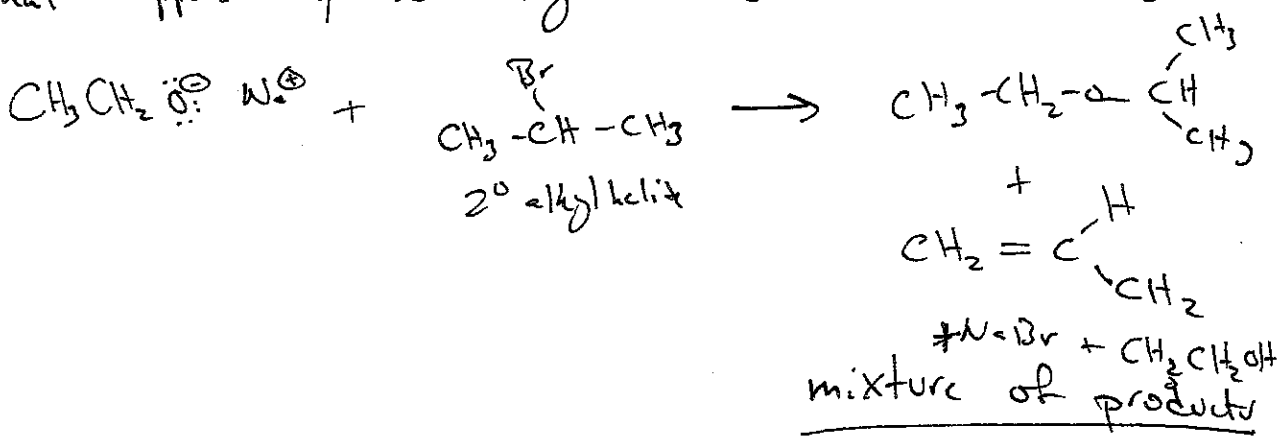
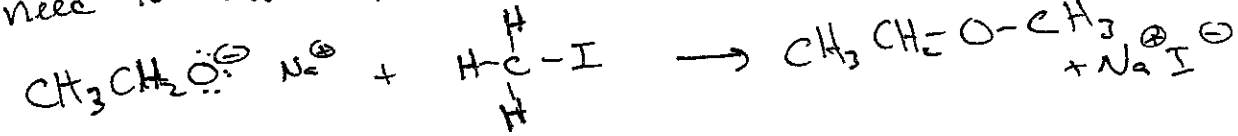
What happens w/ 2° alkyl halides? → Both rxns can occur



mixture of products

Closer look @ Nucleophilic substitution

need to have happen faster than elimination



MeI cannot eliminate

Reaction Rates

obtained by certain parameters → reactant concentration
observe amount of product formed

Rate law (pg 382)

rxn rate = k $[CH_3CH_2O^{\ominus}Na^{\oplus}][CH_3I]$

k = rxn constant

[X] = Concentration

this rxn is dependent on both reactant concentrations therefore,

Rxn is 2nd order → rxn rate dependent on conc of 2 species.

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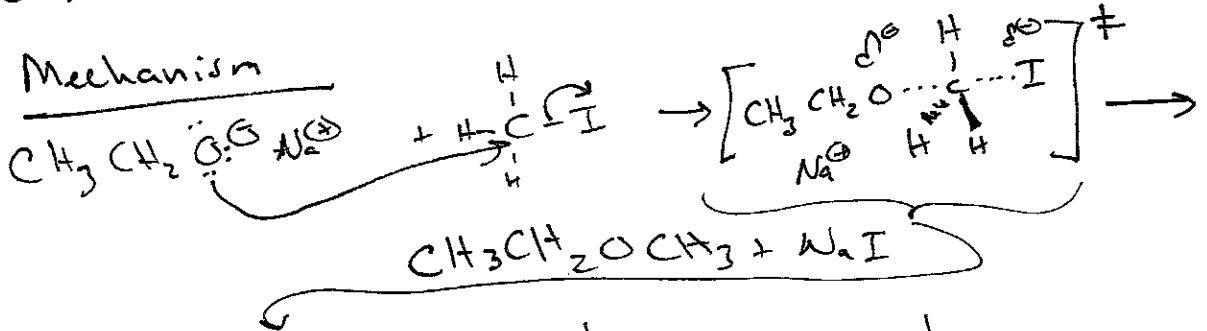
Therefore:
this rxn is 1^{st} order in $[CH_3CH_2O^{\ominus}Na^{\oplus}]$ and
1^{st} order in $[CH_3I]$

Designation of this reaction: S_N2

S = Substitution
N = nucleophile
2 = 2^{nd} overall order of Rxn

(happens w/ a nucleophile + an electrophile that cannot eliminate)

Mechanism



Transition state is bimolecular!
this is reflected in the 2^{nd} order rate constant

Analogy between S_N2 + Bronsted-Lowry acid/base rxn

$CH_3CH_2O^{\ominus} + H{-}I \rightarrow CH_3CH_2OH + I^{\ominus}$

~10^9 faster than w/ CH_3I

steric effects are very important → CH_3I is more bulky than H–I

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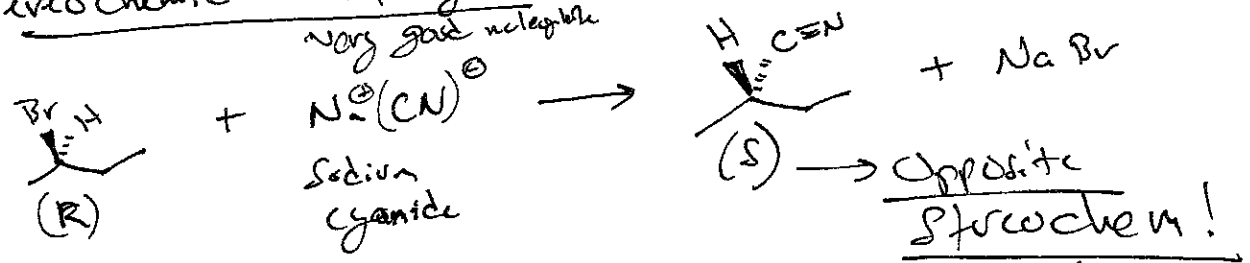
Nucleophile has a harder time reaching the electrophile carbon than the H in H-I

Stereochemical Analysis



→ Opposite Stereochem!

$Na^{\oplus}\ :C{\equiv}N:^{\ominus}$ important building block → C-C bond formation

S$_N$2

Back side attack of the nucleophile on the electrophile