



Cornell University

# Solvents and Solvolysis Reactions

Brendan Parent & Auriole C.R. Fassinou

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# Lecture 12 Learning Objectives

- Classification of Solvents
  - Protic vs. Aprotic
  - Lewis Donor vs. Non-donor
  - Polar vs. Non-polar
- Solvolysis Reactions
  - Tert-butyl Bromide Solvolysis
    - SN1 Mechanism
    - E1 Mechanism

# Introduction to Classifying Solvents

# Protic vs. Aprotic Solvents

- Protic solvents are good hydrogen bond donors
- Aprotic solvents cannot act as hydrogen bond donors



# Polar vs. Non-Polar Solvents

- Polar solvents have dielectric constant  $\geq 15$
- Non-Polar solvents have dielectric constant  $< 15$

-What is the dielectric constant?

# Dielectric Constant (cont.)

# Solvolysis Reactions

Solvolysis:

The reaction of an alkyl halide with a solvent in which no other base or nucleophile has been added.



# Solvolysis of Tert-butyl bromide - SN1

# Solvolysis Continued - E1

# Competing Reactions



# Rearrangement

Final Points  $SN1/E1$ ,  $SN2/E2$

# Putting it all together...

Substrate	Protic Solv.	Aprotic Solv.	Strong Base	Bulky Base
CH <sub>3</sub> -Br	SN2	SN2	SN2	SN2
1°	SN2	SN2	SN2/E2	E2
2°	SN1/E1	SN2	E2/SN2	E2
3°	SN1/E1	SN1/E1	E2	E2