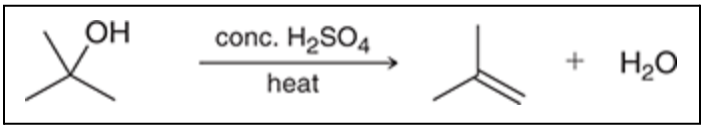
Session 12 Worksheet

Dehydration of Alcohols

Acidic conditions can push alcohols into an elimination rxn



Dehydration: H_2O leaving group

- protonation of an alcohol

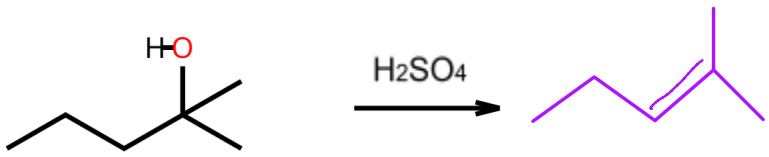
Catalysts Rule:

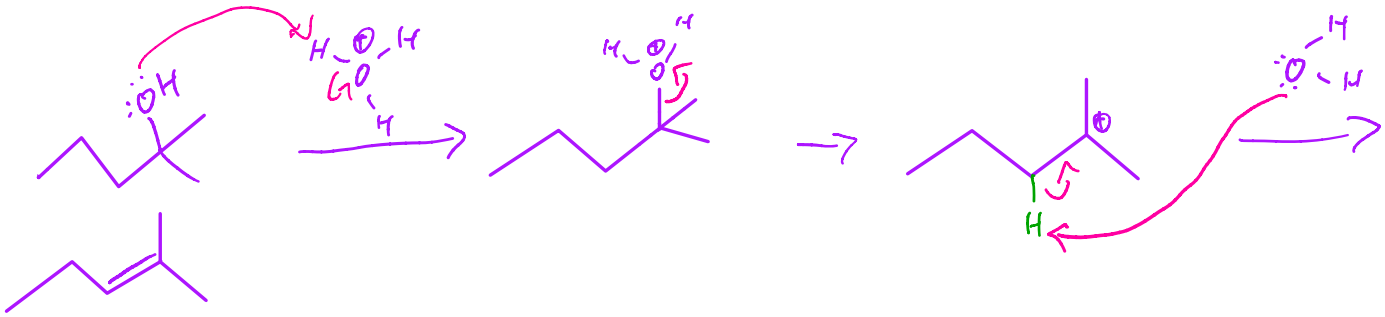
catalysts must always be conserved at the end of a reaction

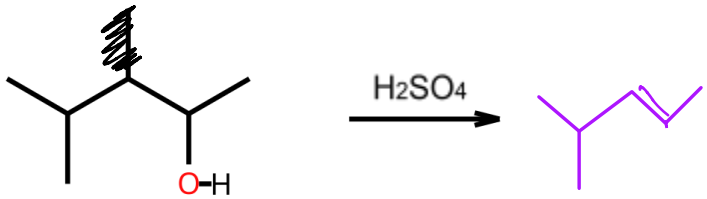
Regioselectivity:

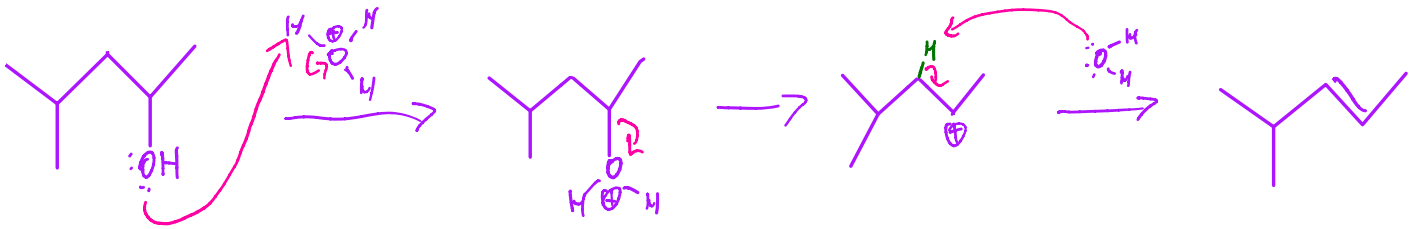
Zaitsev always

Dehydrating 3° and 2° alcohols: E1 rxn

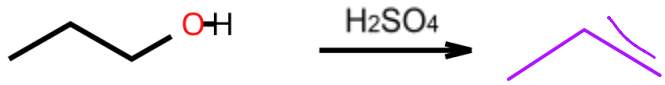


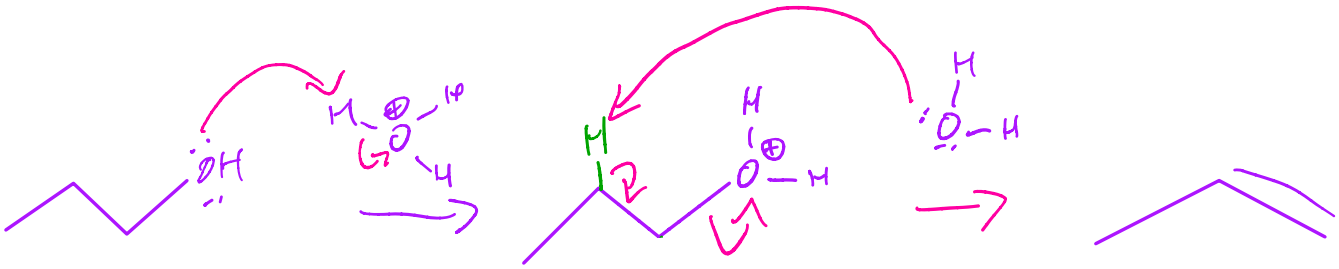






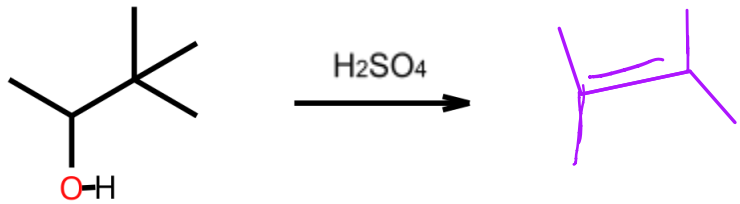
Dehydrating 1° alcohols: E2 rxn

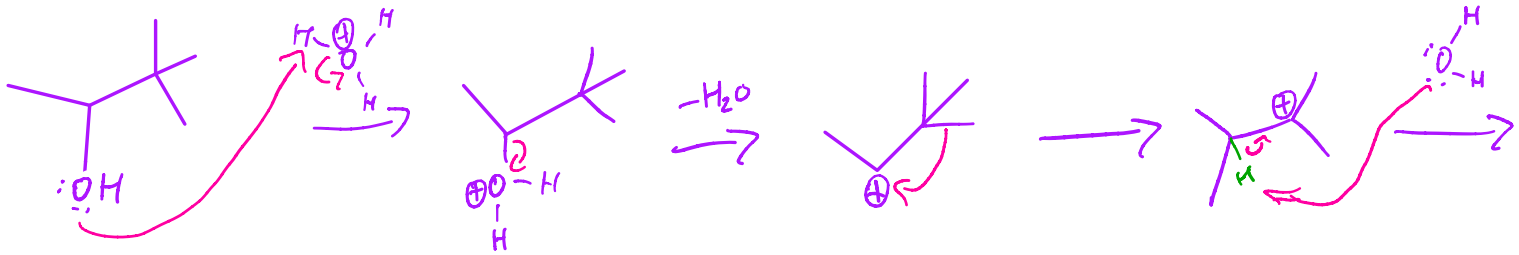


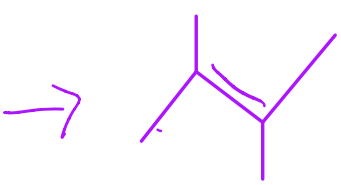


Rearrangement of 2° carbocations

Methyl Shift:

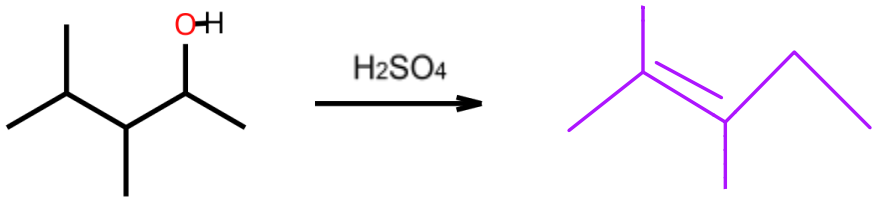


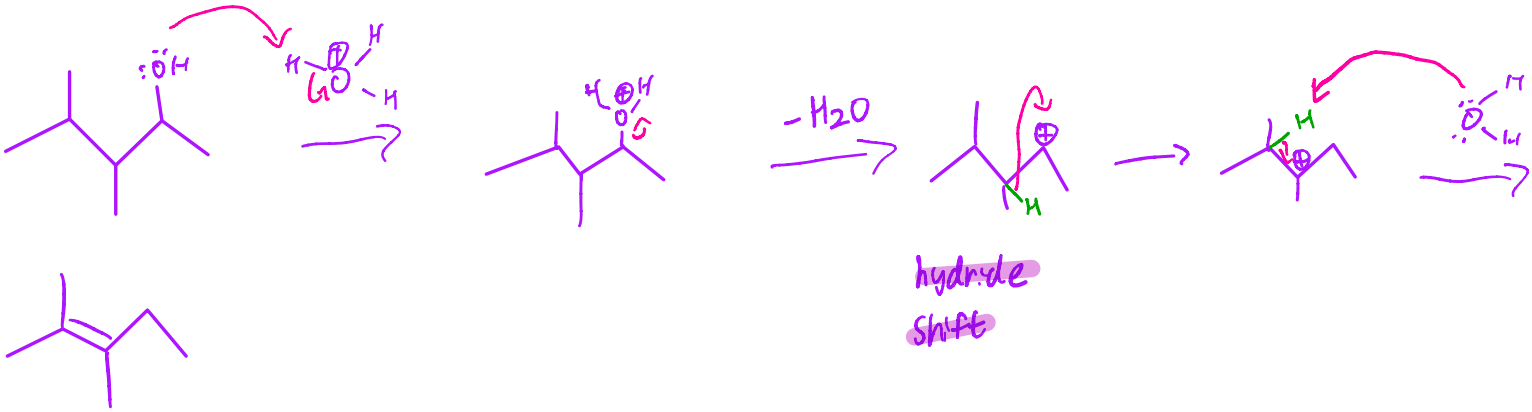




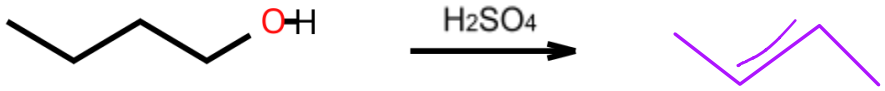
methyl shift

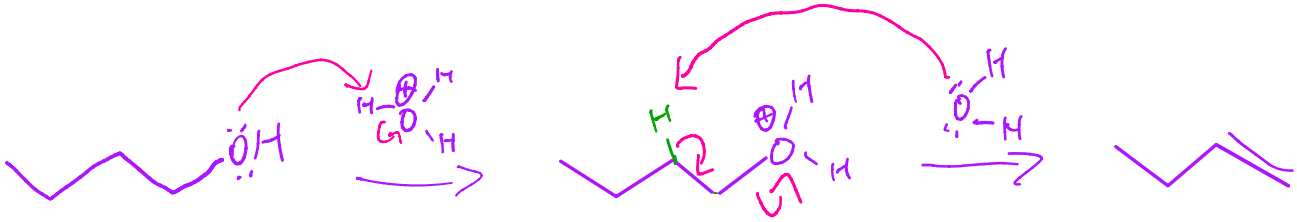
Hydride Shift:

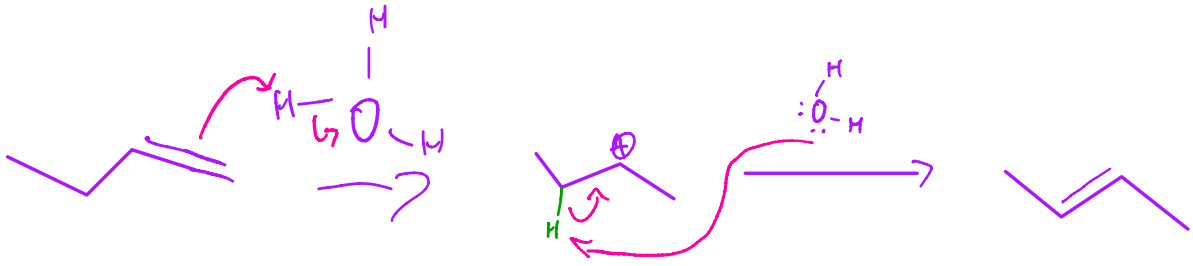




Rearrangement with dehydration of a 1° alcohol:







Determining Nucleophilicity

Charge: more negative charge, better nucelophile

Is cyanide (CN-) or water (H2O) a better nulceophile?

CN^-

less EN atoms can better give up e⁻

Electronegativity: less electronegative atoms are good nulceophiles

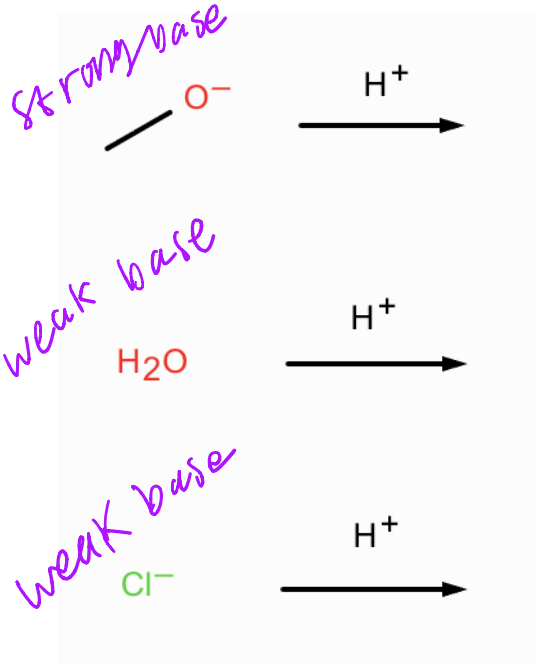
What is the relationship of electronegativty and nulceophilicity?

inverse relationship

Sterics: smaller the nulceophile the better it is

Determing Bascity

Acid-base principle: Look at the conj. acid



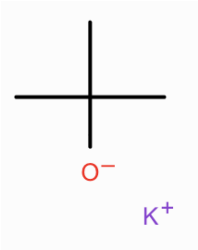
OH weak acid

H_3O^+ strong acid

HCl strong acid

Connecting these ideas

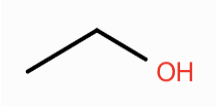
Explain the nulceophilicity and bascity of the following compounds and explain your reasoning. Additionally, what reaction(s) are they most likely going to be able to perform?



Strong base, weak nucleophile

E2

- big molecule = poor nucleophile
- conj acid is weak = strong base
- ⊖ charge = strong



weak base, weak nucleophile

Sn1/E1

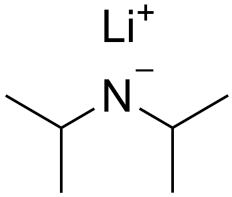
- conj. acid is strong (kinda)
- neutral charge = weak

-OH

strong base, strong nucleophile

Sn2/E2

- small molecule = good nucleophile
- ⊖ charge = strong
- conj. acid is weak



Strong base, weak nucleophile

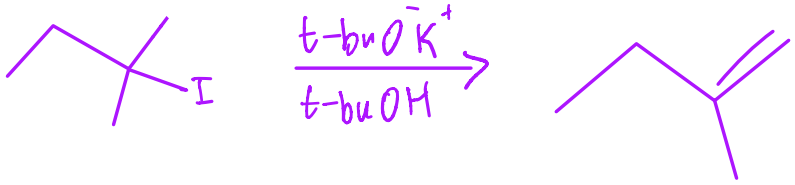
E2

- bulky molecule = poor nucleophile
- ⊖ charge = strong
- conj. acid is weak = strong base

Reaction Senarios

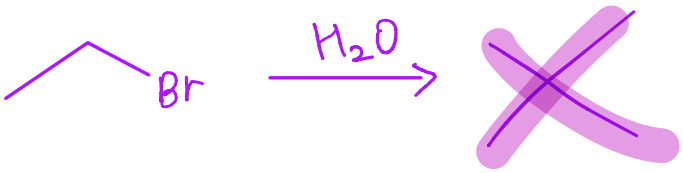
Sam wants to make a special drug what will help him pass his chem final. He wishes to accomplish this by creating a terminal alkene using 2-iodo-2methylbutane. What kind of reaction is he going to do? What would be some good reagents to accomplish this?

- E2 rxn
- make Hofmann prod.



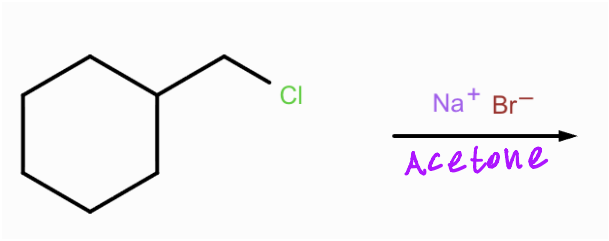
George has CH3CH2Br and is mixing it with water, will he have a proper reaction occur? If so, what kind of reaction is he doing?

NO



This would make a 1° C⁺, the reaction will basically not happen

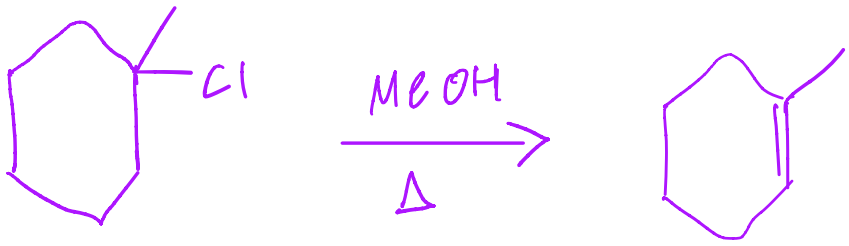
Abigail is doing a reaction (see below). She is undecided on what kind of solvent she needs to use, what would be a good solvent for her reaction? What kind of reaction is she doing?



others:
- DMSO
- DMF
- THF
- dichloromethane

- SN2
- any polar aprotic solvent

Sandy wants to make a potion that will get rid of her acne (god I wish). She is wants to make an alkene using 1-chloro-1-methylcyclohexane and methanol. Will her reaction occur? If it does, what kind of reaction is she doing? What are the conditions she will use to make sure she gets her desired product?



- yes
- This is a competing rxn for SN1 or E1
  - However, we want an alkene, we can add heat (Δ) to the rxn
- in the end, we want an E1 rxn