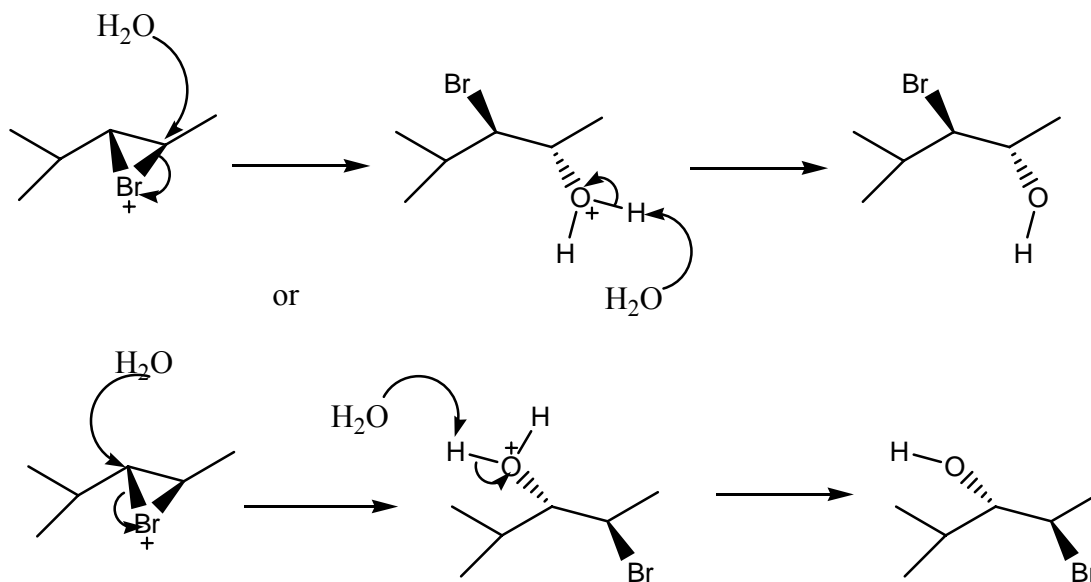


Chem 141
Problem Set
Monday 12 November 2007

1.a) During a halohydrin reaction a bromonium ion is attacked by water via an S_N2 mechanism. Provide a full mechanism for this reaction.

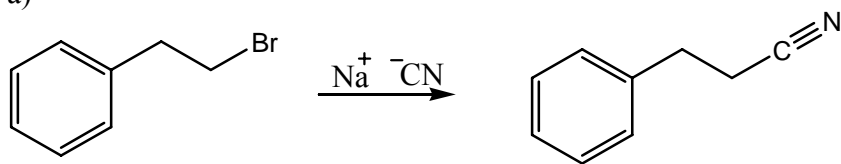


b) Two products are formed what is their relationship?

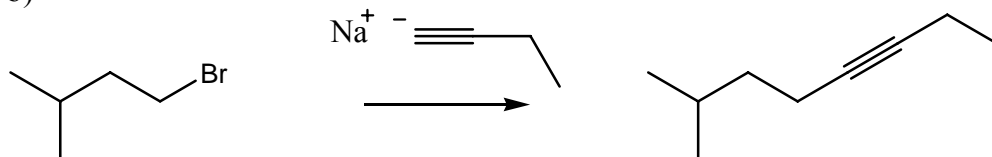
CONSTITUTIONAL ISOMERS

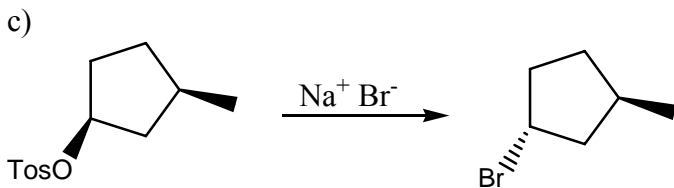
2. What nucleophile could be used to perform the following reactions?

a)



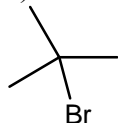
b)



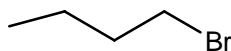


3. Which of the following characteristics would be preferred for a S_N2 reaction and **WHY!!!!**

a) substrate

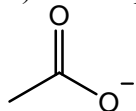


3° alkyl halide
steric hindered

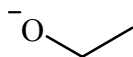


FAVORED: Primary alkyl bromide. The substrate is not sterically hindered. The nucleophile can easily find the δ^+ carbon.

b) nucleophile

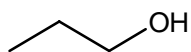


Weak base due to the resonance stabilization of the anion.

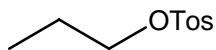


Strong base preferred as nucleophile for S_N2 .

c) leaving group

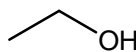


OH^- (negative) is a strong base ie. v. poor leaving group

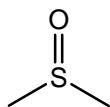


OTos resonance stabilizes the negative charge. This is a very good leaving group/weak base.

d) solvent

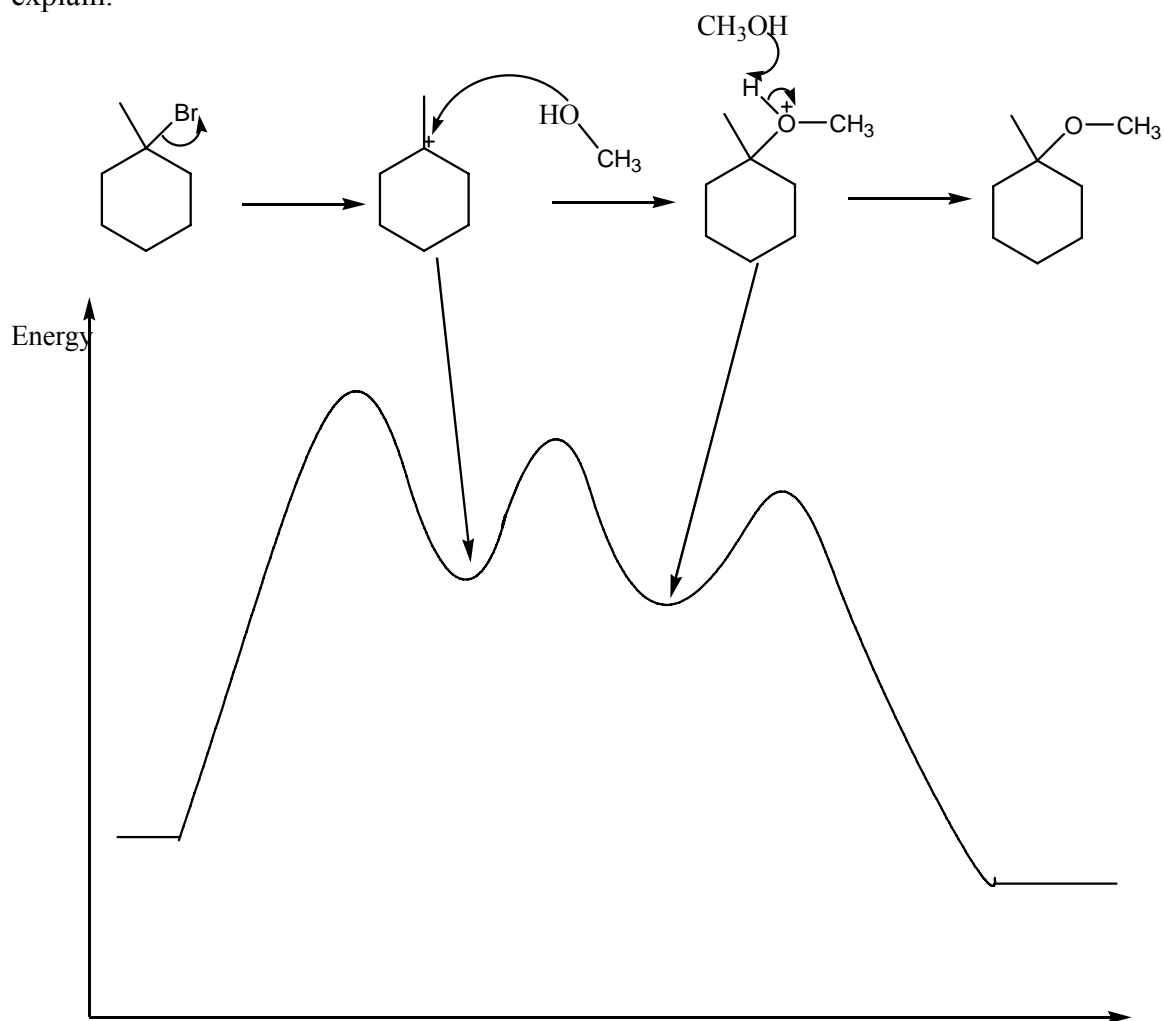


Polar protic favors S_N1



Dimethylsulfoxide (DMSO) is an aprotic polar solvent capable of preferentially solvating cations. The nucleophiles are stripped of the ion partner and act a stronger nucleophile.

4). Why is a S_N1 described as stepwise? Show a mechanism and free energy diagram to explain.



5) What is the rate determining step of an S_N1 mechanism?

FORMATION OF CARBOCATION

6) Does nucleophile concentration or base strength affect the rate of an S_N1 reaction? Why?

No. The **FORMATION OF CARBOCATION** is the rate determining step.

7) Why do protic solvents promote S_N1 reactions?

Polar protic solvents help stabilize the formation of the carbocation during the transition state lowering the activation energy of that step.