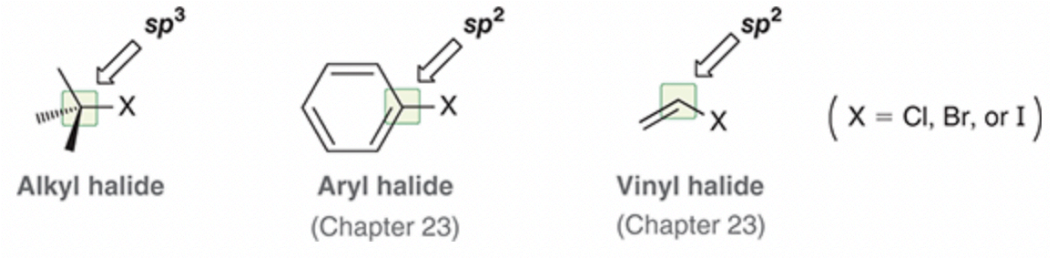
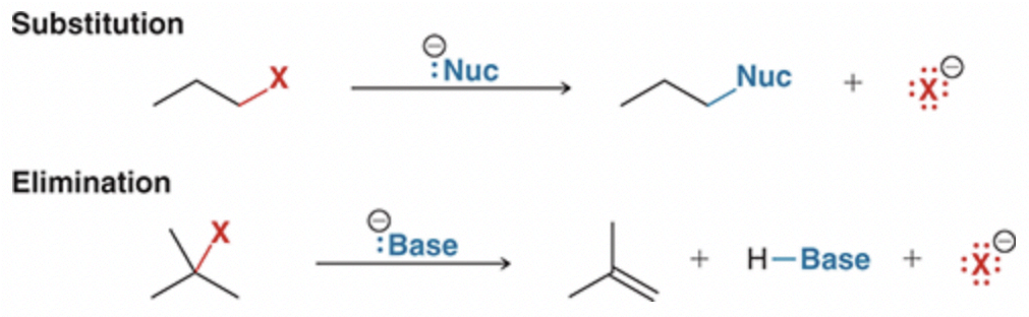
Session 10 Worksheet

Nucleophilic Reactions

Alkyl Halide:



Alkyl halides undergo 2 types of reactions:

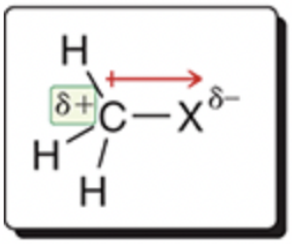


Nucleophile:

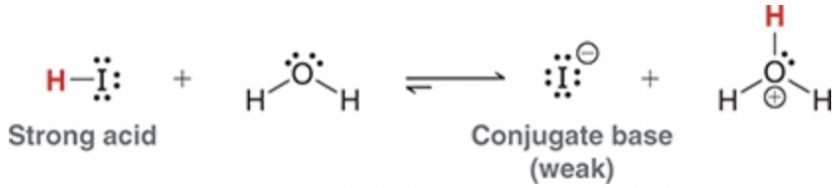
Electrophile:

In an alkyl halide, the halogen serves to:

1.



2.

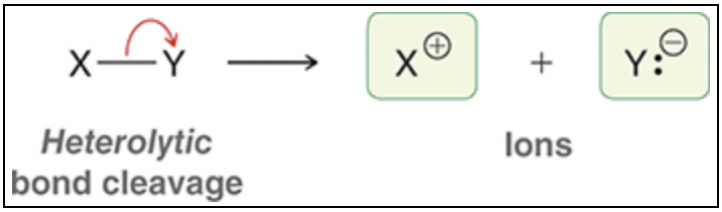


Leaving Group:

Good leaving groups:

For halogens:

Heterolytic bond cleavage:



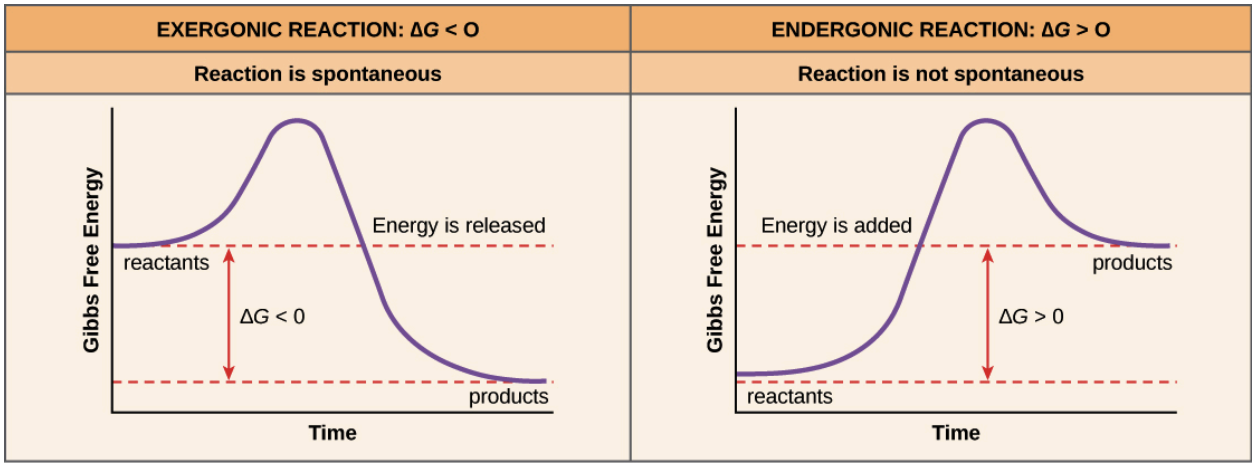
Types of mechanisms:

1. SN2 (concerted mechanism)
2. SN1 (stepwise mechanism)

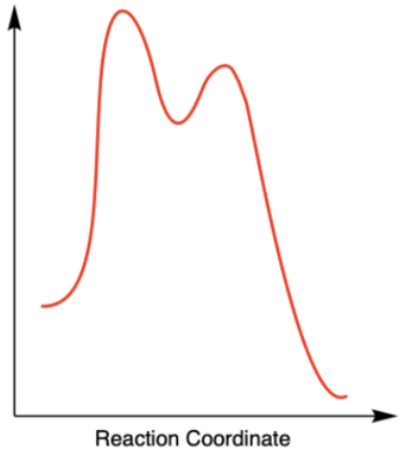
Hammond Postulate

Exergonic Reaction:

Endergonic Reaction:



Reaction Coordinate



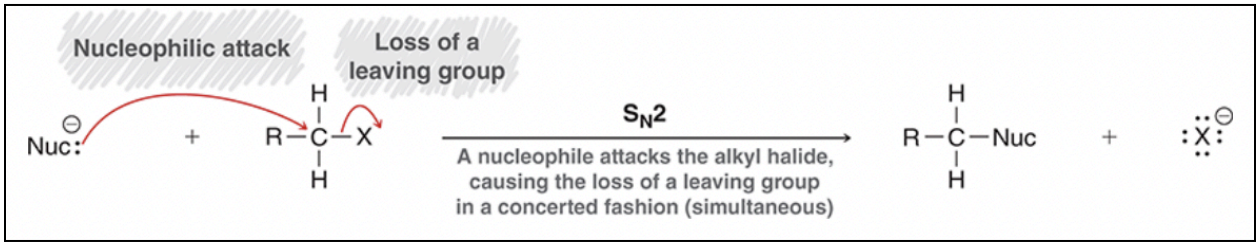
Every peak represents a _____

Every valley represents an _____

SN2 Reactions

SN2

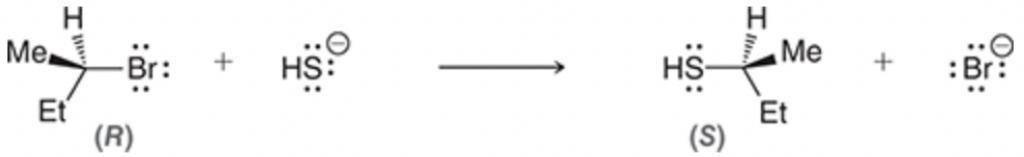
Concerted Mechanism:



Kinetics:

Concept question: What would happen if the concentration of the nucleophile were doubled?

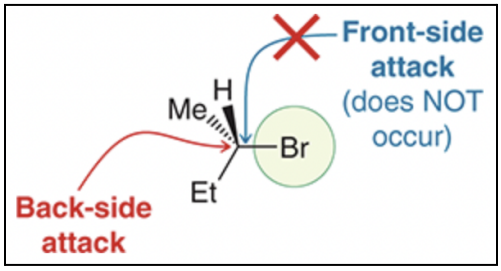
Sterospecificity of SN2:



Nucleophiles attack:

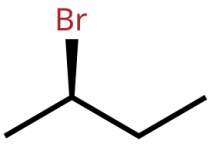
SN2 **WILL NOT** happen on a _____ alkyl halide because there is no room for a backside attack to occur

This is referred to a nucleophilic attack or _____

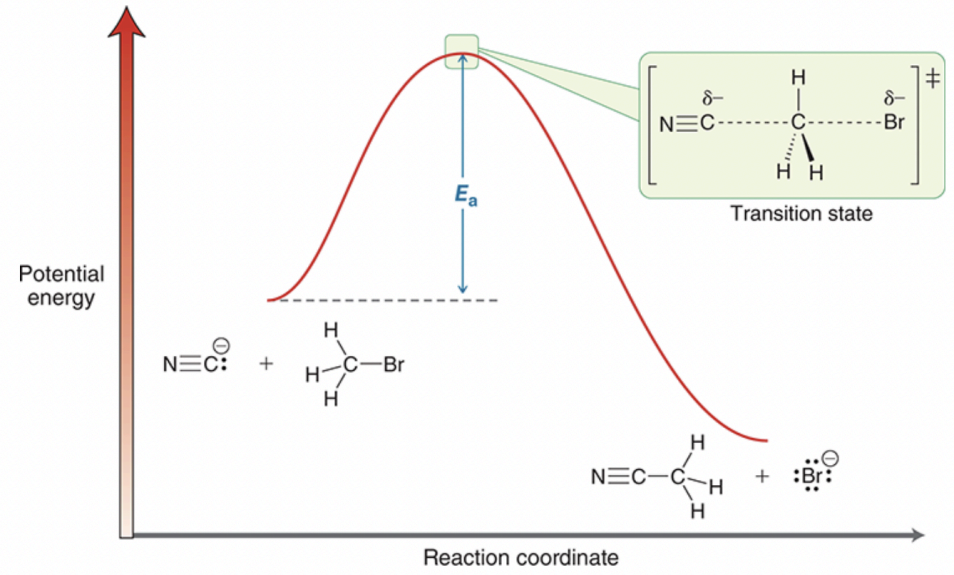


SN2 is stereospecific, meaning:

Example:



Free energy diagram



How many transition states does Sn2 have? How many intermediates?

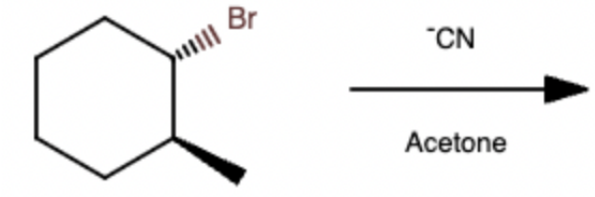
SN2 requires a _____ and _____ alkyl halide

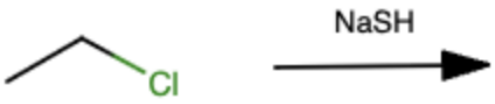
Strong nucleophiles
$:I^-$ $:Br^-$ $:Cl^-$ HS^- HO^- $:N\equiv C^-$ RS^- RO^-

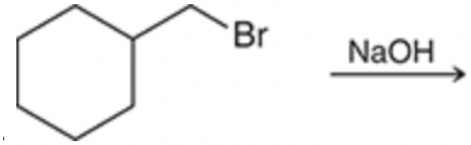
SN2 needs a _____solvent

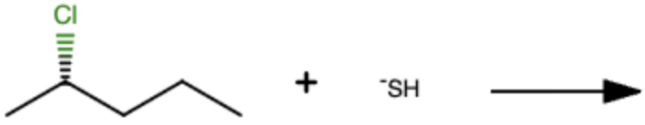
acetone	DMSO (Dimethylsulfoxide)	DMF (*N,N*-Dimethyl formamide)	THF (Tetrahydrofuran)	dichloromethane

Practice: predict the products of the following SN2 reaction and draw the mechanism









Sn1 Reactions

SN1

Uses a _____ mechanism

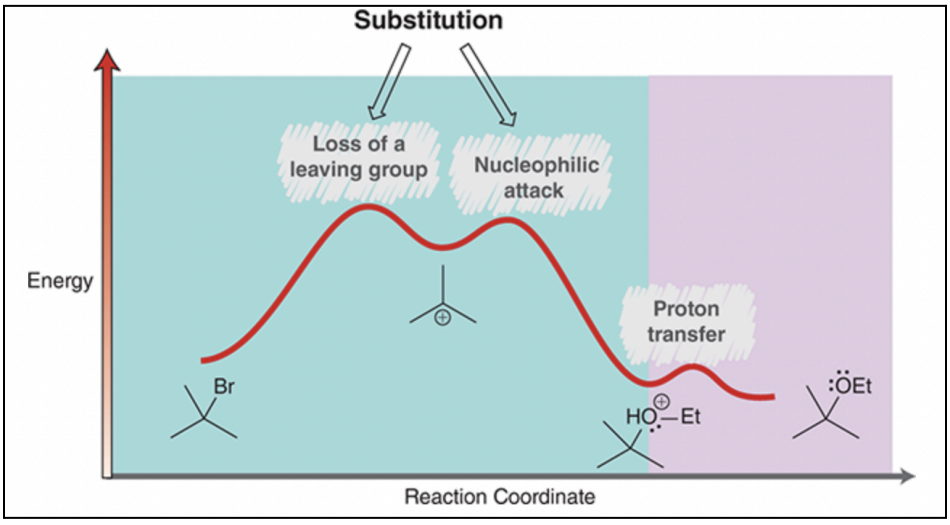
Typically happens on a _____ alkyl halide

Kinetics:

Rate-determining step (RDS):

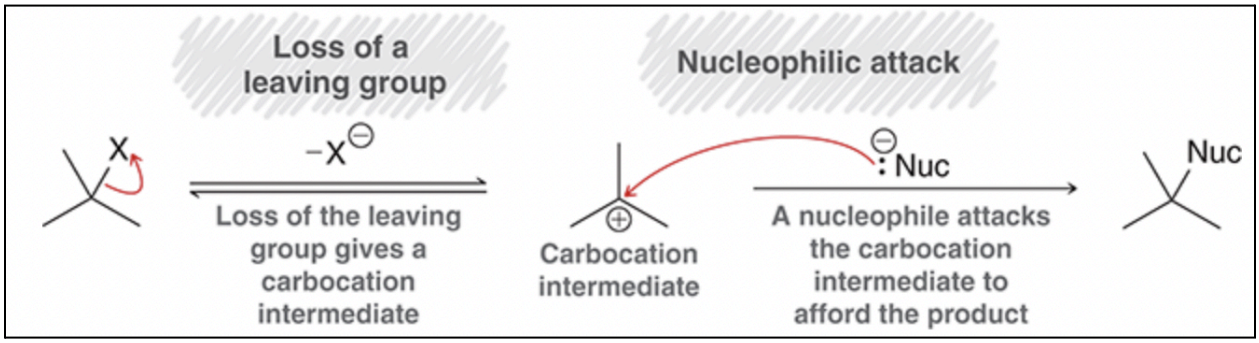
Typically, k1 is the _____RDS, and speeds up with _____ and _____ following after

Free energy diagram:



How many transition states does Sn2 have? How many intermediates?

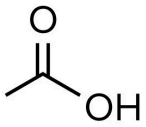
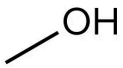
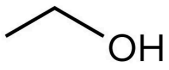
Mechanism of Sn1:



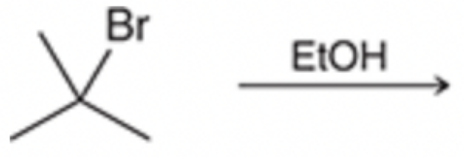
Sn1 Nucleophiles are usually _____

Common weak nucleophiles

Sn1 needs a _____ solvent

Water	H_2O
Acetic acid	
Ammonia	NH_3
Methanol	
Ethanol	

Example:

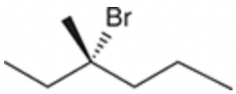


Stability of carbocations:

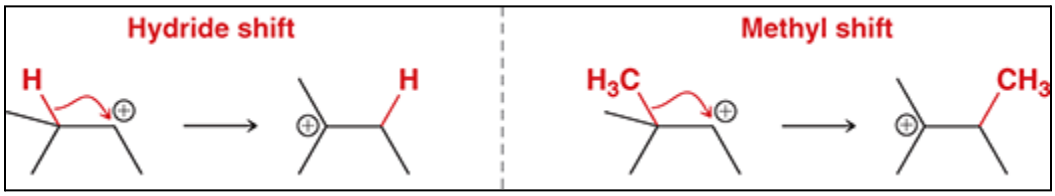
Carbocations have a _____ structure, making the products of

Sn1 a _____

Example:

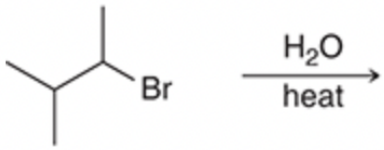


Carbocations can _____ to form the most stable product:

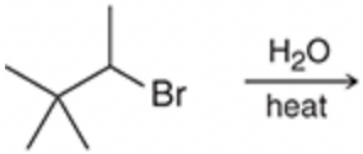


Example (hydride shift):

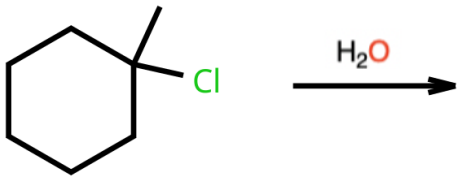
(hydride shift)

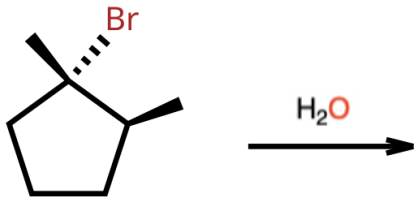


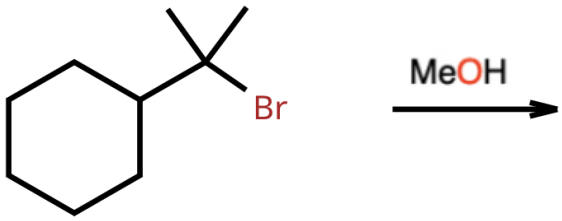
(methyl shift)

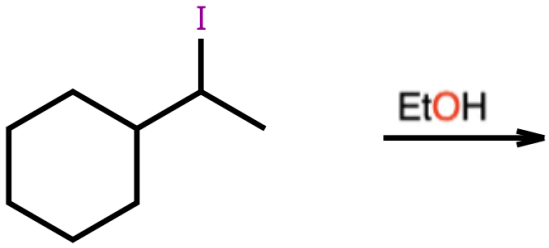


Practice






Br
MeOH


I
EtOH