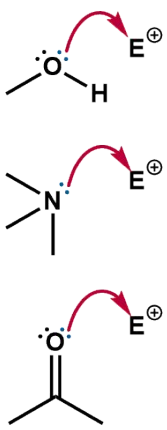
PATTERNS OF ORGANIC REACTION MECHANISMS

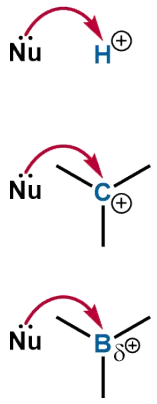
The ***patterns of mechanisms*** approach organizes organic chemistry reactions by their governing mechanism and uses patterns of reactivity.

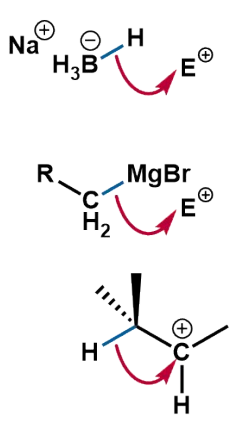
NUCLEOPHILES



σ nucleophiles, lone pairs
Nucleophilic non-bonding electrons

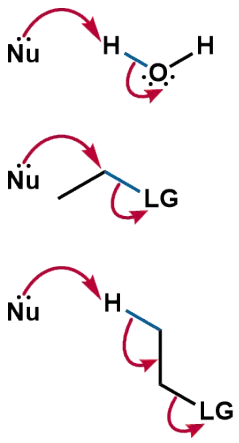
σ electrophiles, empty orbitals
Electronically deficient sites

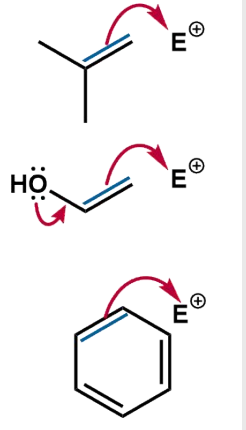




σ nucleophiles, single bonds
Nucleophilic **σ** or **sigma** bonds

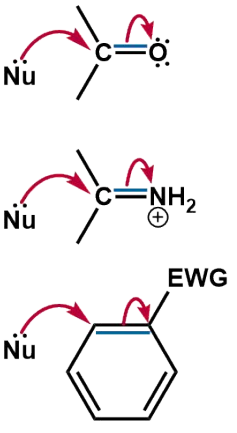
σ electrophiles, single bonds
Electrophilic **σ** or **sigma** bonds





π nucleophiles
Nucleophilic double bonds (**π** or **pi** bonds)

π electrophiles
Electrophilic double bonds (**π** or **pi** bonds)

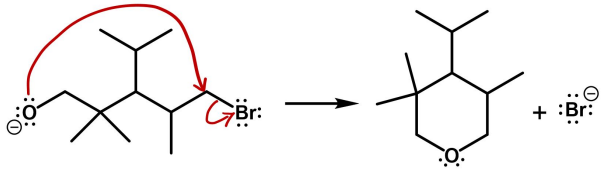


ELECTROPHILES

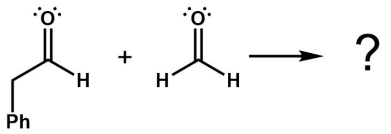
The uOttawa curriculum aims to help students become fluent in organic chemistry's language by mastering the following learning outcomes:

1: Draw the products, given the starting materials and curved arrows.

2: Add curved arrows, given the starting materials and products.



3: Add curved arrows and predict the products, given the starting materials.



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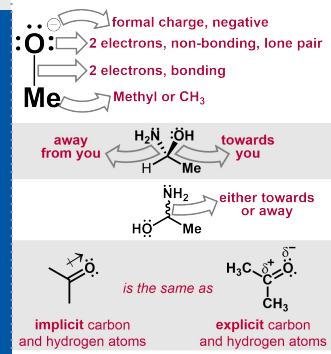
ORGANIC CHEMISTRY LEGEND

Arrows

A → B	A reacts to give B
A ⇌ B	A is in equilibrium with B
A ⟹ B	A is made from B
A ↔ B	A and B are resonance structures
A curved arrow B	A collides with B; the 2 electrons from A create a new bond with B
A curved arrow B	A collides with B; the 1 electron from A creates a new bond with B
A—B curved arrow	The A and B bond breaks; the 2 electrons become a new bond to B or a lone pair on B
A—B curved arrow	The A and B bond breaks; 1 electron moves to A and 1 electron moves to B

Note: None of the arrows above represent the movement of A or B.

Bonds and Electrons



These **square brackets and ‡** mean that the stucture inside is a **transition state**.

partially formed or **partially broken bond**

Common Abbreviations

—Me	*methyl*	—CH_3
—Et	*ethyl*	—CH_2CH_3
—Ph	*phenyl*	

Nu / Nu / Nuc *nucleophile*
E / E *electrophile*

R *any group, generic*
LG *leaving group (e.g. bromine, chlorine)*
EWG *electron withdrawing group (e.g. ester)*
EDG *electron donating group (e.g. hydroxyl)*

FRG FLYNN RESEARCH GROUP

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- A, B : A collides with B; the 2 electrons from A create a new bond with B
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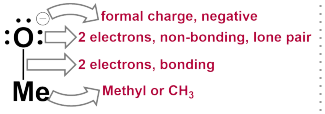
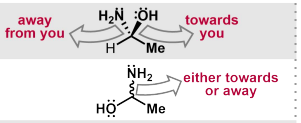
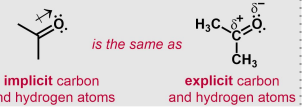
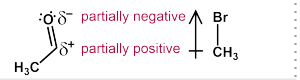
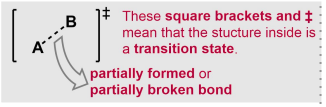
Bonds and Electrons











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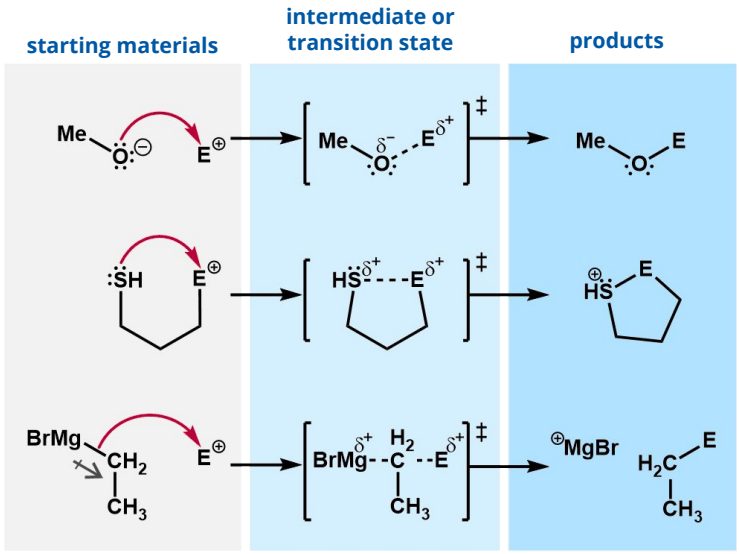
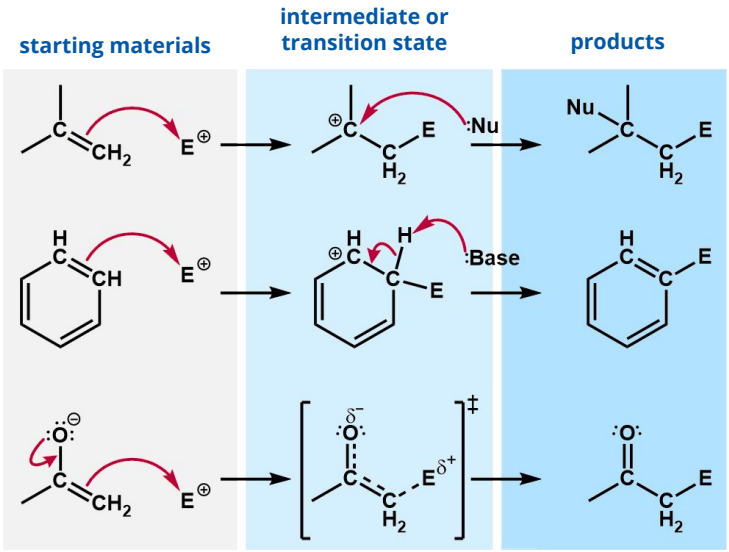
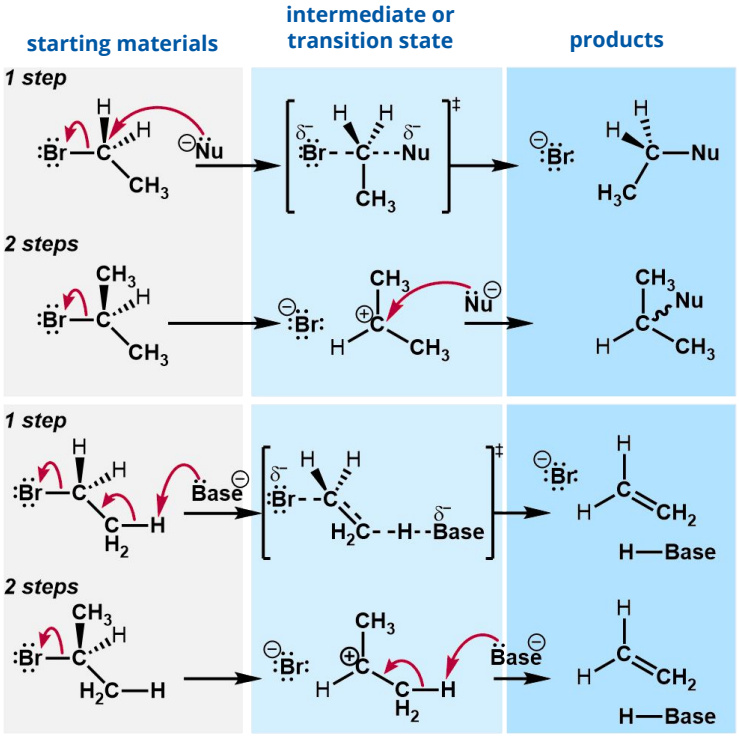
σ nucleophiles



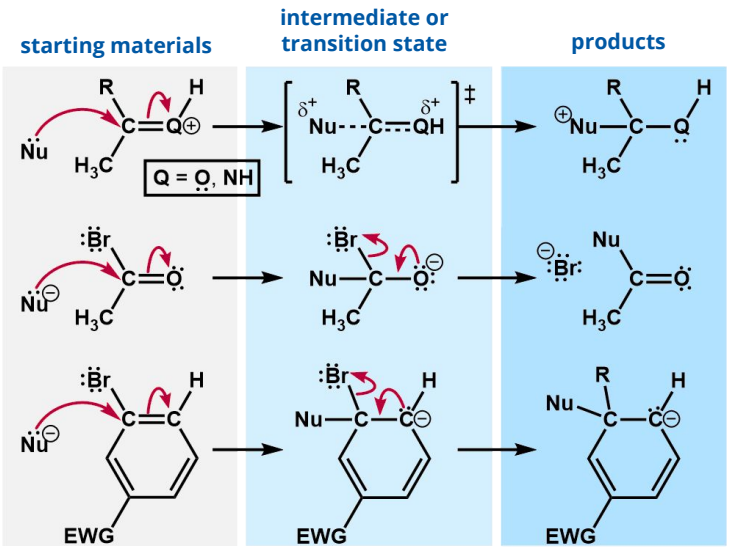
π nucleophiles



σ electrophiles



π electrophiles



For more information check out these resources:
Research Article: *J. Chem. Educ.*, **2015**, *92* (5), pp 803–810
Textbook: *Organic Chemistry Mechanistic Patterns* – nelson.com/orgchem
Flynn Research Group 2017 – FlynnResearchGroup.com
Created by Rebecca Visser and Dr. Amanda Bongers