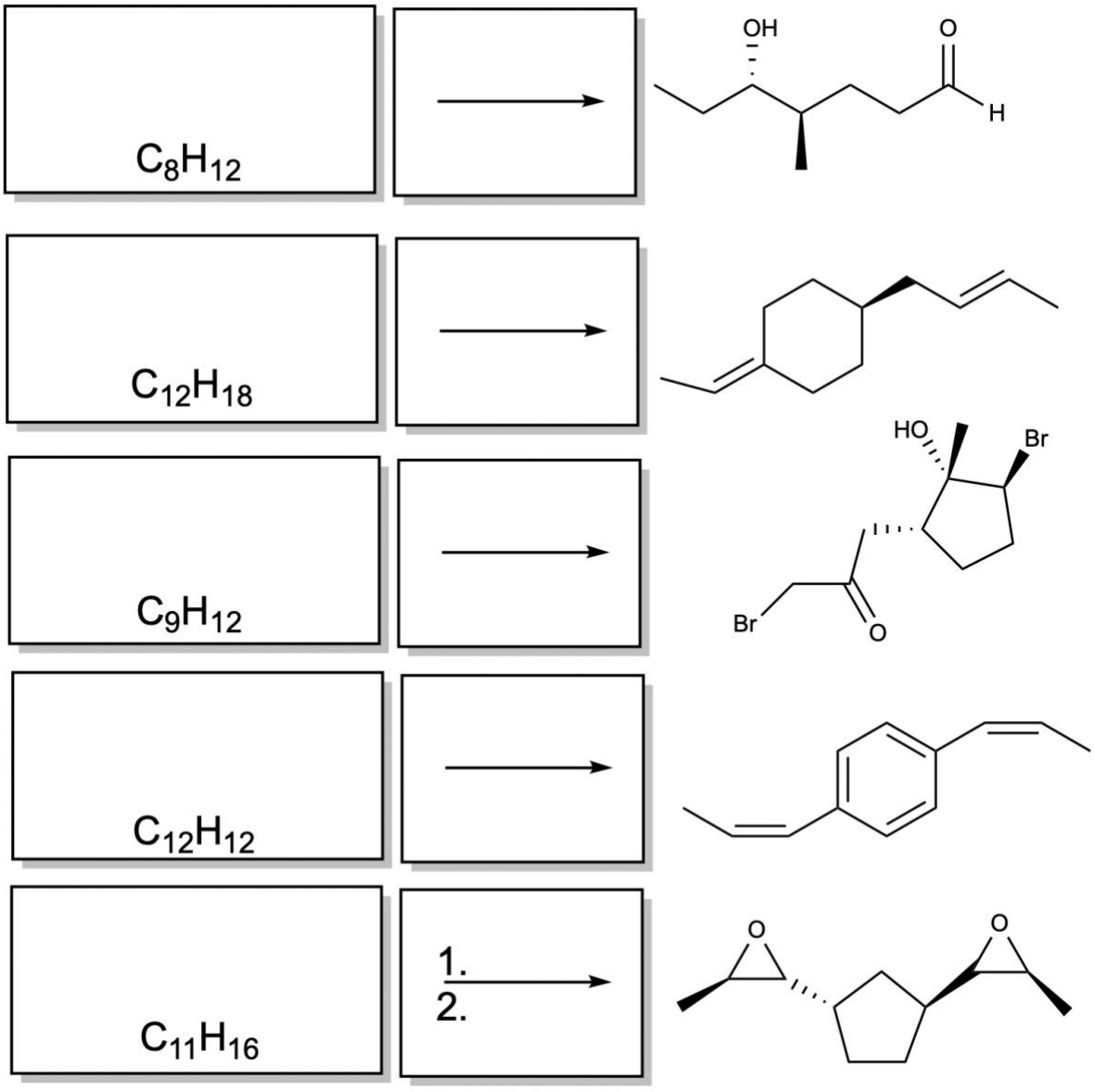
Problem Set 9

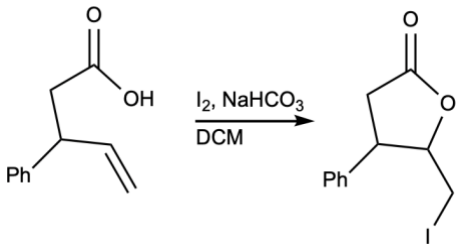
Organic Chemistry 1 (Greenberg)

Fall 2025

1. This week we will do the box questions first. Provide the starting alkynes and the reagents.

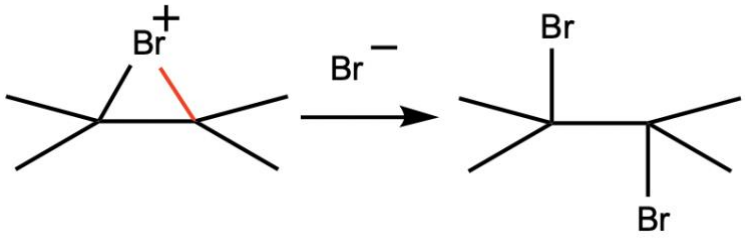


2. Draw a mechanism for the following reaction.

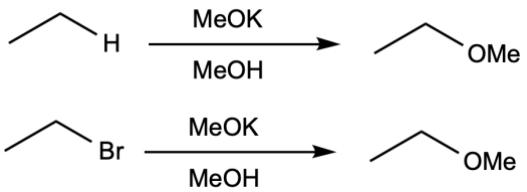


3. Substitution. In Fall 2023, Dr. Greenberg substituted for Dr. Tovar and taught a lecture on substitution reactions. Now it's time to learn about substitution.
    a. There are two types of substitution reactions. SN1 and SN2. What do they stand for?

    b. Let's rationalize a backside attack. For the following reaction (red bond), draw the C-Br antibonding orbital and label the dipole of the C-Br bond.

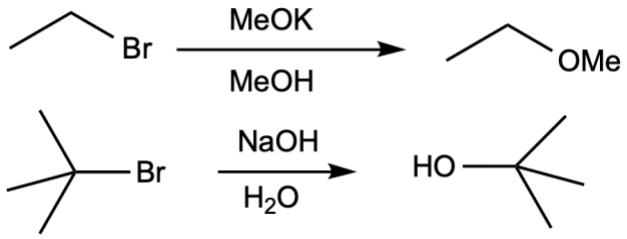


    c. Now let's rationalize why halogens are better leaving groups than hydrogens. The strength of leaving groups are determined by their acidity. First identify the HOMO and LUMO for the following reaction, then draw a qualitative molecular orbital diagram showing any energy differences.



d. Write a rate equation for a generic SN1 and SN2 reaction. Use arbitrary rate constant k_1 and k_2 for SN1 and SN2 respectively. Why are these different?

e. Draw the mechanism for the two following reactions. For the SN1 reaction, draw the carbocation intermediate. For the SN2 reaction, draw the transition state.



f. Solvent effects. The "solvating power" is important. We will consider two types of solvents: Polar aprotic and Polar protic. Determine whether the following solvents are polar aprotic or polar protic. Draw the solvation of a Bromide ion in water and acetone.

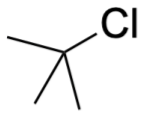
Bromide: Br^-
Water: H_2O
Acetone: CH_3COCH_3

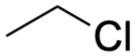
g. SN2 reactions are favored in POLAR APROTIC solvents. SN1 reactions are favored in POLAR PROTIC solvents. Rationalize this using the mechanistic differences between SN1 and SN2, as well as the solvent diagrams drawn above.

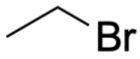
4. Let's summarize below. Fill in the following table with!

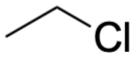
	Sn1	Sn2
Main factor(s) affecting rate of reaction		
Preferred carbon E+		
Preferred Nu- strength		
Stereochemistry of products		

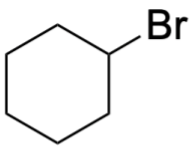
5. For each of the following pairs of molecules, identify which molecule will more readily undergo an SN2 reaction and briefly explain why to make Dr. Greenberg happy.

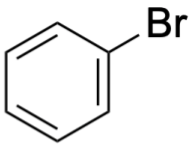


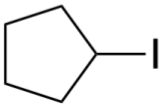


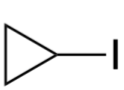












Clubs and Orgs Bulletin:

Promote your club! https://forms.gle/V19BipzLyuAaWMyz8

Studio North

Are you interested in gaining hands-on film production experience and want to meet other film fans? Come to Studio North, JHU's student-run production club!
Join our slack at https://tr.ee/XGIXuc7Mcv for updates on GBMs and workshops, and follow our Instagram @studionorthmd!

A Place To Talk

Need to vent about something or talk through an issue? Come visit an APTT room! Want to encourage your organizations' members to be more compassionate and welcoming? Schedule listening and empathy trainings by email apttexternaltraining@gmail.com
Learn more: @jhuaptt or https://pages.jh.edu/aptt/

Tip of the Week:

The Red Zone refers to the period of time between the start of fall semester and Thanksgiving when the majority of sexual assaults on campus occur. The peak in the Red Zone occurs around Halloween, so it is important to refresh your knowledge on consent and sexual assault resources during this time.
Confidential sexual assault resources at JHU include the Counseling Center Sexual Assault Helpline at (410) 516-7333 and the Hopkins Sexual Assault Resource Unit Hotline at (410) 516-7887.
Access more resources and educational materials on consent on Instagram @jhusaru and @chewatjhu.