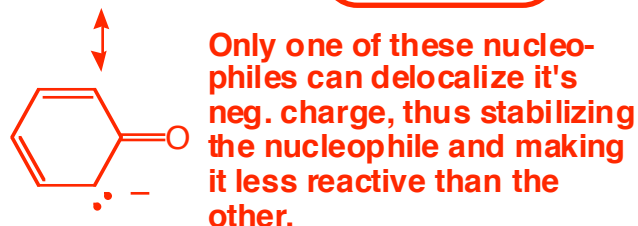


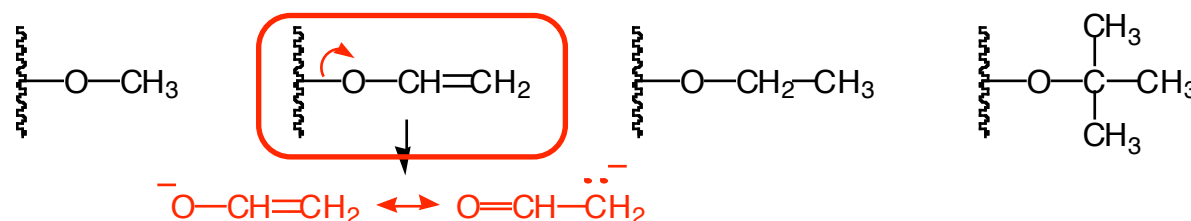
1. Circle the answer that best fits each description and provide an explanation (using pictures & words) for your decision using only the space provided. (5 points each)

A) The best nucleophile in an aprotic solvent.



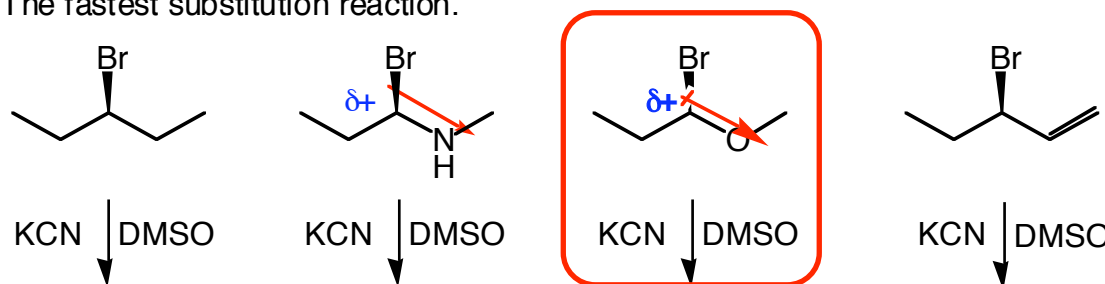
These two are neutral (and thus stable) oxygen-containing molecules. Without a negative charge, their effectiveness as nucleophiles is diminished.

B) The best leaving group in a protic solvent.



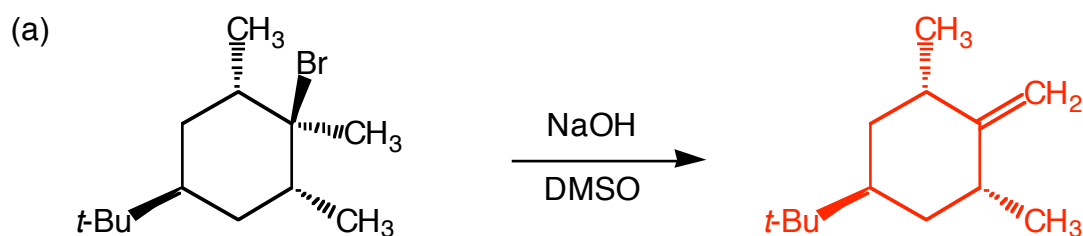
Resonance helps to stabilize the group after it leaves by delocalizing the negative charge. The other lvg grps cannot be stabilized by resonance and thus are less stable and worse lvg grps.

C) The fastest substitution reaction.

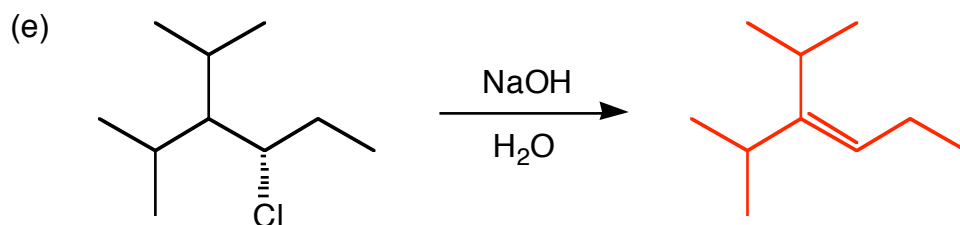
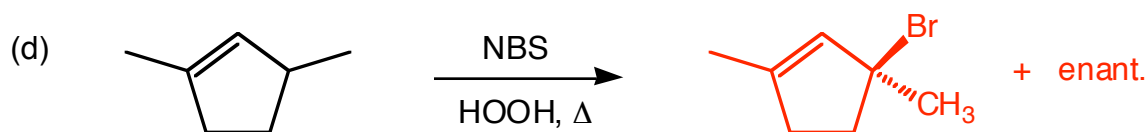
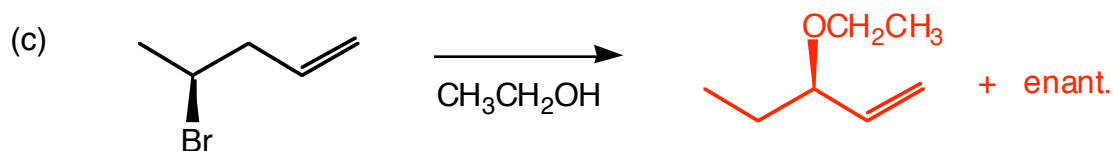
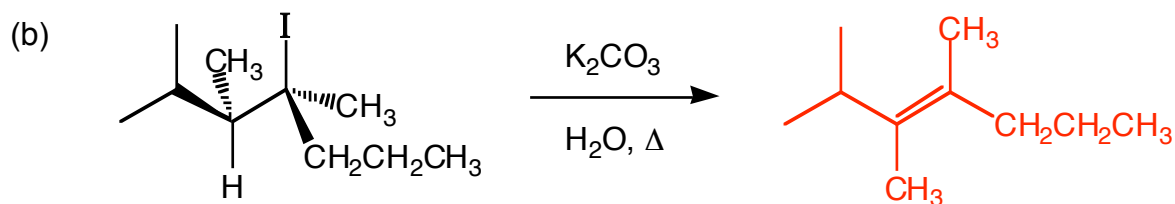


The more electroneg. oxygen withdraws electron density towards it by induction, creating a more partially positive carbon for the nucleophile to attack. This increases the rate of reaction in this SN2 reaction.

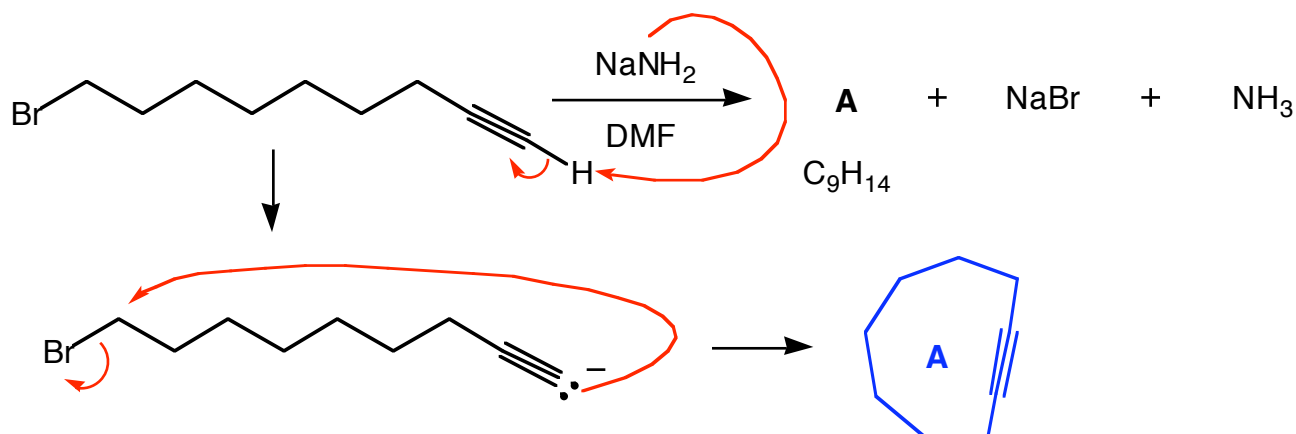
2) Predict the *major* organic product of each of the following reactions and circle it. If more than one product is equally favored, draw and circle each product. (7 points each)



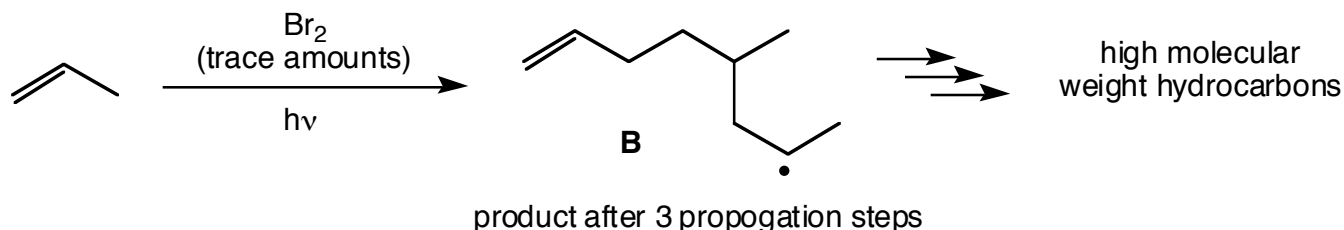
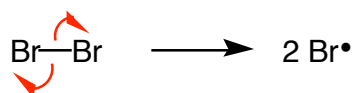
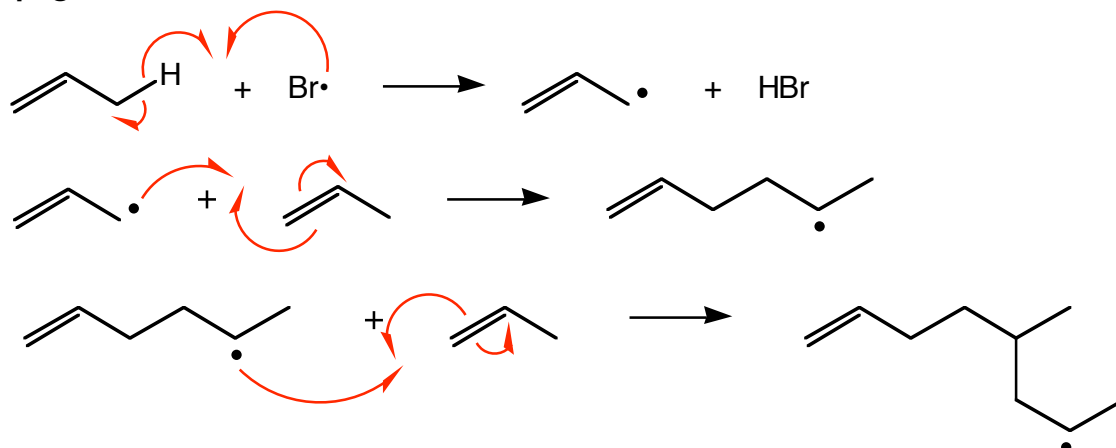
Predict the products (cont'd)



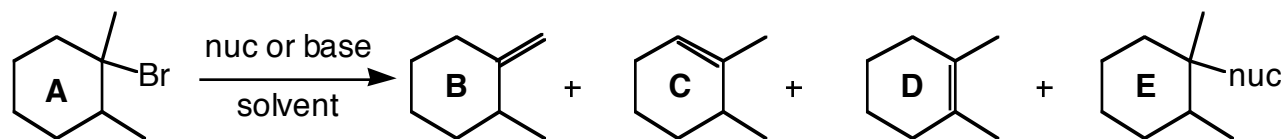
3) The following reaction gives an organic product (A) which *does not contain an alkene*. Provide a structure for A and provide a mechanism for its formation. Note: you must provide the intermediates of each step and their charges (if any) for full credit. (10 points)



- 4) In an attempted to perform the following radical halogenation, a chemist made the mistake of only using a trace (tiny) amount of molecular bromine. Instead of the usual alkyl bromide, he obtained hydrocarbons of unusually high molecular weight as products. Intermediate B is what was formed after only a few propagation steps. Provide a mechanism that accounts for the formation of B. Note: you do not need to provide any termination steps, but you do need to label the initiation and propagation steps. (12 points)

**Initiation****Propagation**

- 5) Refer to the reaction shown and answer true (T) or false (F) to each statement. (2 points each)



- T** a) It is possible to produce **B** as the major product with the appropriate combination of **A** (with respect to stereochem), base, and solvent.
- T** b) It is possible to produce **C** as the major product with the appropriate combination of **A** (with respect to stereochem), base, and solvent.
- T** c) It is possible to produce **D** as the major product with the appropriate combination of **A** (with respect to stereochem), base, and solvent.
- F** d) The rate of formation of **E** can be increased by increasing the concentration of nucleophile.
- T** e) **E** can never be racemic regardless of the choice of **A** (with respect to stereochem), base, and solvent.

6) Propose a synthesis (sequence of reactions) for each of the following transformations. *Be sure to include the products of each step for full credit. (5, 8, and 5 points, respectively)*

