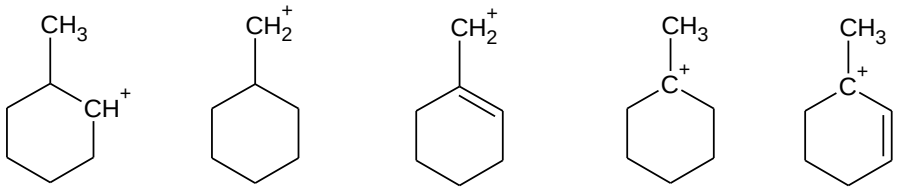
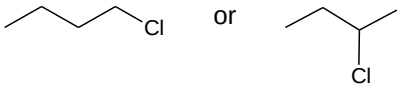
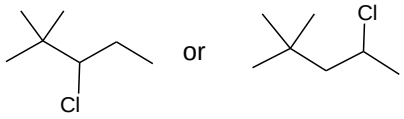
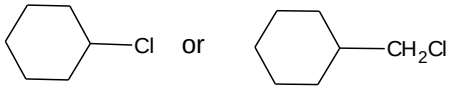
1. List the following carbocations in decreasing order of stability.

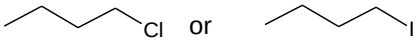


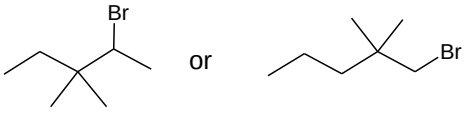
2. Which of the compounds in the following pair will undergo S_N2 reaction faster? Give a reason for your answer.

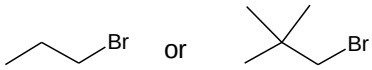
a) 

b) 

c) 

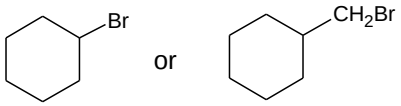
d) 

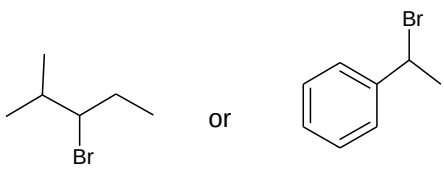
e) 

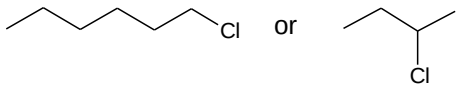
f) 

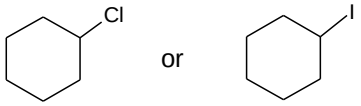
3. Predict which compound will undergo solvolysis faster. Give a reason for your answer.

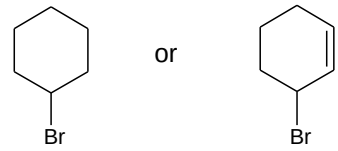
a) $(CH_3CH_2)_2CH\text{-}Cl$ or $(CH_3)_3C\text{-}Cl$

b) 

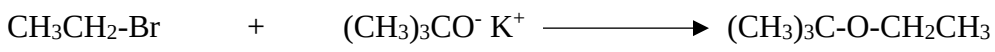
c) 

d) 

e) 

f) 

4. When ethyl bromide is added to potassium t-butoxide, the product is ethyl t-butyl ether as shown below:



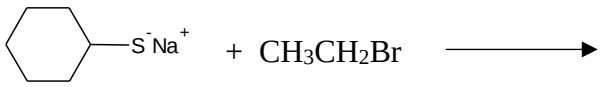
a) What happens to the reaction rate if the concentration of ethyl bromide is doubled?

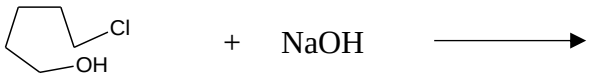
b) What happens if the concentration of potassium t-butoxide is tripled?

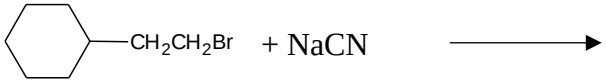
c) What happens if the temperature is increased?

5. Predict the products for the following S_N2 reactions.

a) 

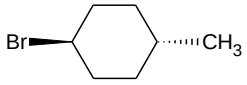
b) 

c) 

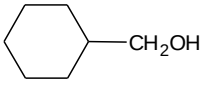
d) 

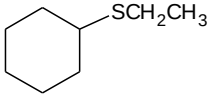
e) $CH_3(CH_2)_8CH_2Cl$ + $Na^+ {}^-C{\equiv}CH$ ⟶

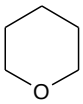
f) $(CH_3)_3C\text{-}CH_2CH_2Br$ + NH_3 ⟶

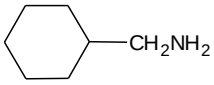
g)  + NaOH ⟶

6. Show how each of the following compounds can be made by S_N2 reaction of an alkyl halide.

a) 

b) 

c) 

d) 

e) $H_2C{=}CH\text{-}CH_2CN$

f) $H\text{-}C{\equiv}C\text{-}CH_2CH_2CH_3$

7. Give two synthesis of $(CH_3)_2CH\text{-}O\text{-}CH_2CH_3$ and explain which one is better.