

Discussion Problems

(1) Which of the following S_N2 reactions is the fastest?

- (a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br} + \text{OH}^- \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + \text{Br}^-$
 (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br} + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + \text{HBr}$
 (c) $\text{CH}_3\text{CH}_2\text{CHBrCH}_3 + \text{OH}^- \rightarrow \text{CH}_3\text{CH}_2\text{CHOHCH}_3 + \text{Br}^-$
 (d) $\text{CH}_3\text{CH}_2\text{CHBrCH}_3 + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{CHOHCH}_3 + \text{HBr}$

(2) Which of the following is the best leaving group?

- (a) HO^-
 (b) F^-
 (c) Cl^-
 (d) Br^-
 (e) I^-

(3) Rank the species below in order of increasing nucleophilicity in protic solvents: CH_3CO_2^- , CH_3S^- , HO^- , H_2O

- (a) $\text{H}_2\text{O} < \text{HO}^- < \text{CH}_3\text{S}^- < \text{CH}_3\text{CO}_2^-$
 (b) $\text{H}_2\text{O} < \text{CH}_3\text{CO}_2^- < \text{HO}^- < \text{CH}_3\text{S}^-$
 (c) $\text{CH}_3\text{CO}_2^- < \text{HO}^- < \text{CH}_3\text{S}^- < \text{H}_2\text{O}$
 (d) $\text{CH}_3\text{S}^- < \text{H}_2\text{O} < \text{CH}_3\text{CO}_2^- < \text{HO}^-$

(4) Which of the following is the best nucleophile in water?

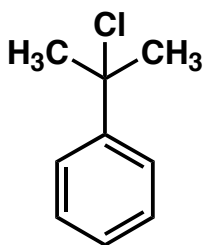
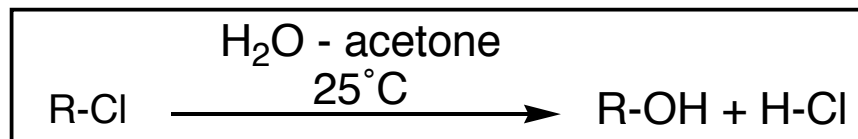
- (a) I^-
 (b) CH_3SCH_3
 (c) CH_3OCH_3
 (d) Cl^-

(5) Which of the following alkyl halides gives the fastest S_N1 reaction?

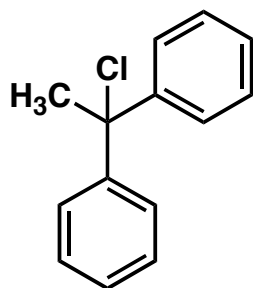
- (a) **A**
 (b) **B** $\text{CH}_3\text{—I}$ $\text{CH}_3\text{CH}_2\text{—Br}$ $\text{CH}_3\text{CH}_2\text{—I}$ $\text{CH}_3\text{—}\overset{\text{H}}{\underset{\text{Br}}{\text{C}}}\text{—CH}_3$ $\text{CH}_3\text{—}\overset{\text{H}}{\underset{\text{I}}{\text{C}}}\text{—CH}_3$
 (c) **C**
 (d) **D** **A** **B** **C** **D** **E**
 (e) **E**

Discussion Problem

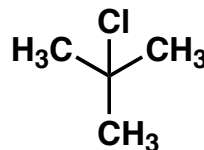
Rank chlorides **I-IV** with respect to their relative rates of hydrolysis in water-acetone at 25°C. Explain your reasoning. Be prepared to draw a reaction coordinate diagram to justify your answer.



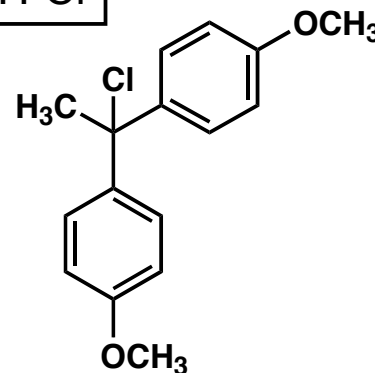
I



II



III



IV

Discussion Problem

When methyl iodide reacts with a thiocyanate ion, SCN^- , the reaction takes place at the sulfur atom. With the cyanate ion, OCN^- , the reaction takes place at the nitrogen. Draw the structures of the thiocyanate and cyanate ions including the lone pair electrons and formal charges. Draw an important resonance contributor for each ion. Use curved arrow convention to show the electron flow for the reaction of these ions with CH_3I . Draw the structure of the resulting products, including lone pair electrons.

