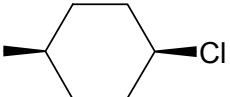
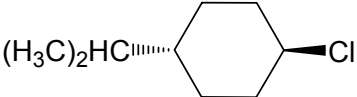


INTRODUCTORY ORGANIC CHEMISTRY I --- PROBLEM SET #3
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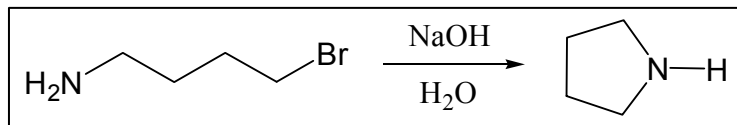
INSTRUCTIONS: ANSWER ALL QUESTIONS ON THESE PAGES.

HAND IN (stapled, with no extra pages please) ON **Thursday April 10th** (I will hold office hours that day from 6-7pm.)
ALL MATERIAL CAN ALL BE FOUND IN THE CLASS NOTES and/or IN BRUICE CHAPTERS 1-9, 11.

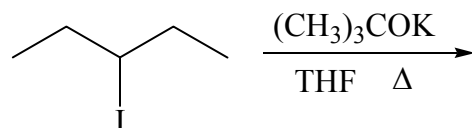
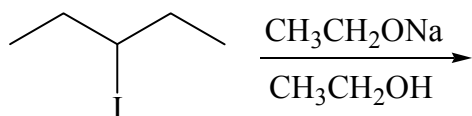
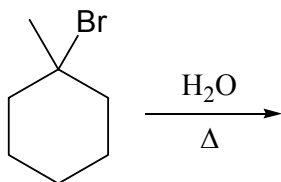
1. Provide one or two key words for explanation, and circle the reagent in each pair that is most...

- Nucleophilic in a polar aprotic solvent: $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}^-$ or OH^-
- Nucleophilic in a polar aprotic solvent: $(\text{CH}_3)_3\text{CO}^-$ or $\text{CH}_3\text{CH}_2\text{O}^-$
- Reactive towards $\text{S}_{\text{N}}2$: $\text{CH}_3\text{CHBrCH}_3$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
- Reactive towards $\text{S}_{\text{N}}1$: $\text{CH}_3\text{CHICH}_3$ or $\text{CH}_3\text{CHClCH}_3$
- Reactive towards $\text{E}1$: $\text{CH}_3\text{CHBrCH}_3$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
- Reactive towards $\text{E}2$: $(\text{H}_3\text{C})_2\text{HC}$  or $(\text{H}_3\text{C})_2\text{HC}$ 

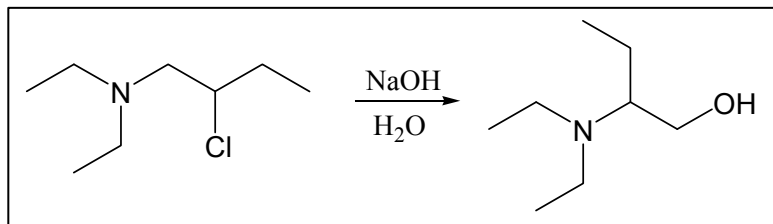
2. Write a step-by-step "arrow-pushing" mechanism to explain the following organic product.



- # 3. Draw **line structures** of the major product(s) of the reactions below. If more than one product is likely, draw both but indicate which product is preferred and why. For each rxn, also include:
- the expected stereochemistry
 - a few keywords about the mechanism that explain the reaction outcome (e.g., substitution/elimination (S_N1 , S_N2 , E1, E2), C^+ /radical intermediate, concerted, etc.).



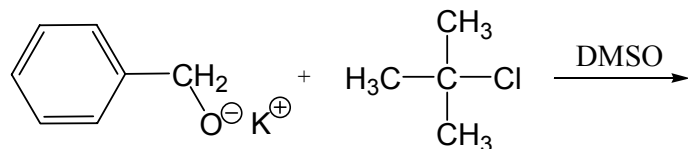
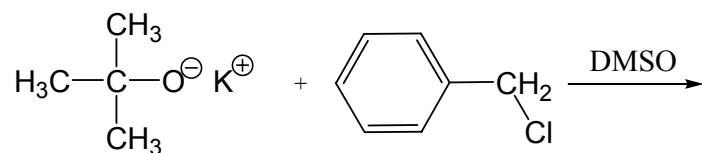
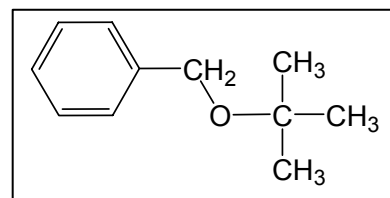
- # 4. Write a mechanism for formation of the observed substitution product (which might not be the only product - it is simply the product of interest). If the starting material has the S configuration, what is the configuration of the stereocentre in the product?



5. Which sequence of reagents would work best to convert 1-bromobutane to hexane? Explain briefly. *Hint: you may need to refer to the alkyne reactions from Ch.6...*

- | | | |
|---|----------------------------------|---|
| a) 1. NaOCH ₃ , CH ₃ OH | 2. NaCN | 3. Na, NH ₃ |
| b) 1. NaC≡CH | 2. H ₂ (excess), Pd/C | |
| c) 1. CH ₃ CH ₂ OH, Δ | 2. H ₂ (excess), Pd/C | |
| d) 1. NaCH | 2. BH ₃ /THF | 3. H ₂ O ₂ , OH ⁻ , H ₂ O |
| e) 1. NaC≡CCH ₂ CH ₃ | 2. Na, NH ₃ | |

6. The Williamson ether synthesis involves treatment of an alkyl halide with a metal alkoxide. Shown below are two reactions intended to give benzyl *tert*-butyl ether (shown in the box). One reaction gives the ether in good yield, the other reaction does not. Which reaction gives the ether? What is the product of the other reaction, and how do you account for its formation?



7. Synthesize the following compounds (via a series of sequential reactions) starting from the starting material shown. You can use any other reagents you need. **For each step in your pathway:**

- **above/below the reaction arrow: show the required reagents (+ solvent & conditions if critical)**
- **after the arrow: draw the major product (& if you think the yield will not be good, say so...)**

Hint: Refer to Bruice sections 4.12, 6.12 & 9.11 for synthetic strategies and practice.

