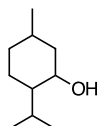


Chem 12A Review

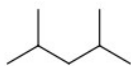
1. Nucleophiles and electrophiles

- Are anions more likely to be nucleophiles or electrophiles? Are cations more likely to be nucleophiles or electrophiles?
- Which is the reactive part of NaOCH_3 ? Is this part of NaOCH_3 a nucleophile or electrophile?
- See a pK_a table. Which substances are good leaving groups? Is SO_4^{2-} a good LG? Is HPO_4^{2-} a good LG?
- Is an alpha carbon a nucleophile or electrophile? What property supports your answer?
- Is a H bonded to a beta carbon a nucleophile or electrophile? Give reasons.
- A pi bond is a nucleophile. Why does a pi bond react with HCl but not CH_3COOH ?
- Acetylene reacts with a strong base to form the acetylide ion, HCC^- . Will an electrophile react with the pi bond or the lone pair? Give reasons.

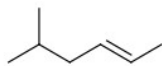
2. Menthol is a compound that gives a cool sensation.



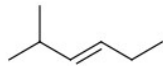
- What is the chemical formula of menthol? Draw the Lewis structure of menthol to support your answer.
- Circle the most acidic proton. What is the approximate pK_a ?
- Box the alpha carbon(s). Draw in the H's bonded to the beta carbon(s). Triangle the leaving group(s).
- Which skeletal structure matches $(\text{CH}_3)_2\text{CHCH}_2\text{CHCH}_3$?



A



B



C

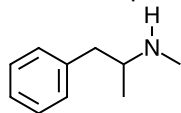
3. Ethanol ($\text{C}_2\text{H}_5\text{OH}$) is the alcohol that we humans can drink in small quantities without getting too sick. It is also organic solvent and is produced by fermentation of sugar.

- HCl reacts with ethanol to produce $\text{C}_2\text{H}_5\text{OH}_2^+$ and Cl^- . Use curved arrows to show how reactants produce products. What is the reaction type?
- $\text{C}_2\text{H}_5\text{OH}_2^+$ reacts with Cl^- to form ethyl chloride. Use curved arrows to show how reactants produce products. What is the reaction type?
- Cl^- will not react with ethanol to produce ethyl chloride. Explain why.
- Ethyl chloride spray is used as a topical anesthetic (it freezes and numbs the skin.) Ethyl chloride reacts with a base to form ethylene (which is used to make polyethylene plastic). What base could you use? Use curved arrows to show how this base reacts with ethyl chloride to produce ethylene. What is the reaction type?
- Ethylene reacts with HCl to form _____. Fill in the blank. Use curved arrows to show how reactants produce products. What is the reaction type?

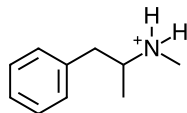
4. 2-bromobutane is a colorless liquid with a pleasant odor but is toxic and flammable.

- 2-bromobutane reacts with KOC_2H_5 .
 - Circle the nucleophilic atoms in 2-bromobutane. Box the electrophilic atoms in 2-bromobutane.
 - Draw the structure of the substitution and two elimination products. Use curved arrows to show how each product is formed.
 - Which product is the major product? Give reasons.
- You want to synthesize 2-chlorobutane from 2-bromobutane. Would you use HCl or Cl^- ? Explain why one works and the other does not.
- Does HCCH react with 2-bromobutane? If so, draw the structure of the product.
- Does HCC^- react with 2-bromobutane? If so, draw the structure of the product.

5. Methamphetamine is a stimulant. Two forms of methamphetamine are shown below.



A



B

- How many alpha carbons are in Structure A?
- Which form of methamphetamine has the better leaving group? Give reasons.
- Structure A does not react with Br^- . Explain why.
- Structure B reacts with Br^- . Draw the structure of the all the possible substitution and elimination products.
- Which product is the major product? Give reasons.

6. S-adenosylmethionine (SAM) is an alkylating agent that is found in biological reactions. The synthesis of SAM is shown below.

a. Identify the reaction type.

b. Circle the alpha carbon(s) and box the beta carbon(s). Is the alpha carbon a chirality center?

c. Triangle the leaving group.

d. What is the nucleophile?

e. State the reaction mechanism type.

