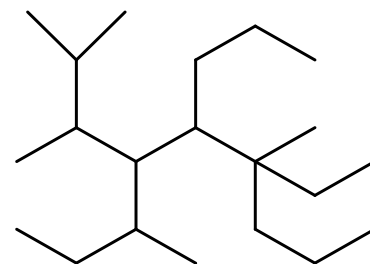


## Organic Chemistry Practice Problems

### Organic Chemistry I Practice Set #3 (Chapters 1-2 - Carey)

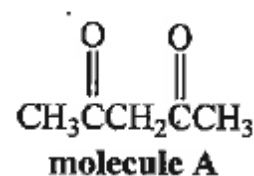
- For the compound given to the right, provide a name.
- For each of the following, consider the compound given in *problem 1*.
  - How many *tertiary H's* are there?
  - How many *methylene groups* are there?
  - How many *quarternary Cs* are there?
  - How many *primary Cs* are there?



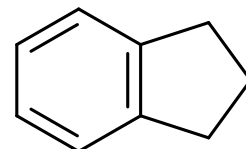
- Provide a structure for 4-(*tert*-butyl)-1-isobutyl-2-isopropyl-1-methyl-6-(2-methylbutyl)cycloheptane. **Provide a complete structural formula – showing all atoms and all bonding valence electrons.**

- Consider *molecule A* shown to the right. Remember your Lewis structure rules.

- Using Lewis structures for reactants and products and using curved arrows to show the flow of electrons in *molecule A*, give the chemical equation that shows the heterolytic dissociation of *one* of the six *primary CH bonds* in *molecule A* to give  $H^+$  and the corresponding conjugate base. If resonance structures exist for the conjugate base, give all important resonance structures for the conjugate base. Clearly indicate the value of each of the three CCC bond angles in this conjugate base of *molecule A*.
- Using Lewis structures for reactants and products and using curved arrows to show the flow of electrons in *molecule A*, give the chemical equation that shows the heterolytic dissociation of *one* of the two *secondary CH bonds* in *molecule A* to give  $H^+$  and the corresponding conjugate base. If resonance structures exist for the conjugate base, give all important resonance structures for the conjugate base. Clearly indicate the value of each of the three CCC bond angles in this conjugate base of *molecule A*.
- Using structural considerations, identify which of the two Hs is the more acidic one. Provide a clear, concise explanation.



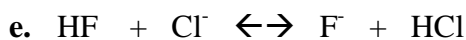
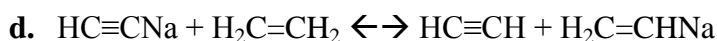
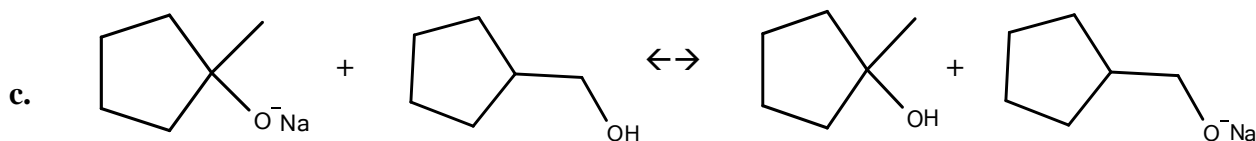
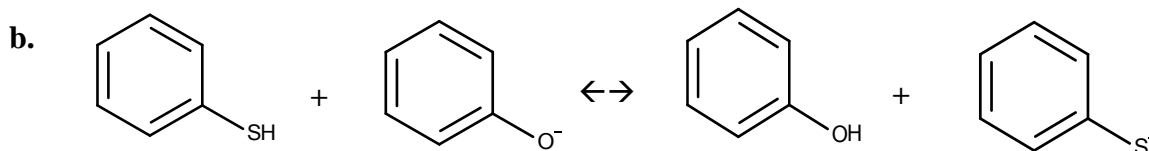
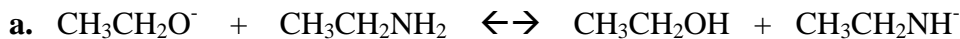
- Draw structural formulas for 5 (*and only 5*) constitutional isomers that *have one three-membered ring* and the molecular formula  $C_5H_{10}O$ . Your structural formulas must have no nonzero formal charges and the most typical arrangements of bonding and nonbonding valence electrons. **Provide complete structural formulas – showing all atoms and all bonding valence electrons.**
- Using the molecular formula for the compound shown to the right in the chemical equation, give the balanced chemical equation for the combustion of the compound shown.



## Organic Chemistry Practice Problems

7) Consider each of the following.

Does the equilibrium lie to the *left* or *right*?



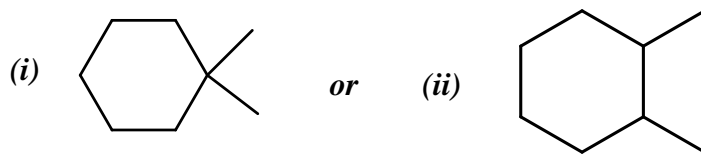
8) (a) Which compound is thermodynamically more stable:

(i)  $\text{CH}_3(\text{CH}_2)_3\text{CH}_3$  or (ii)  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$

(b) Which compound has the larger heat of combustion:

(i)  $\text{CH}_3(\text{CH}_2)_3\text{CH}_3$  or (ii)  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$

(c) Which one is a geminally disubstituted cyclohexane:



(d) Give a Lewis structure for the conjugate base in Problem 7(d).

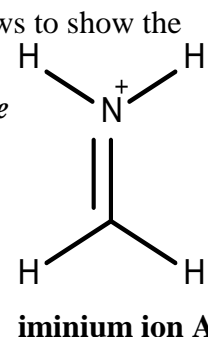
(e) Is a 1,1-dimethylpentyl group a (i) primary (ii) secondary (iii) tertiary (iv) quaternary alkyl group?

(f) What is the hybridization of each C in the acid given in Problem 7(c). (i)  $\text{sp}^3$  (ii)  $\text{sp}^2$  (iii)  $\text{sp}$

9) Consider the structural formula of **iminium ion A** given to the right.

a. Using Lewis structures for each reactant and each product and using curved arrows to show the flow of electrons in the reactants, give a chemical equation for the reaction between water and **iminium ion A** in which **water acts as a Bronsted-Lowry base** and **iminium ion A acts as a Bronsted-Lowry acid**.

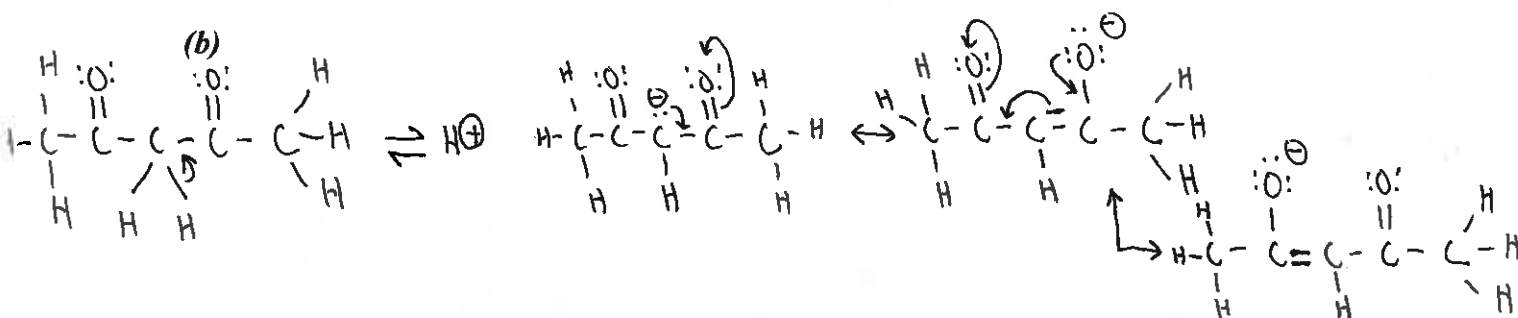
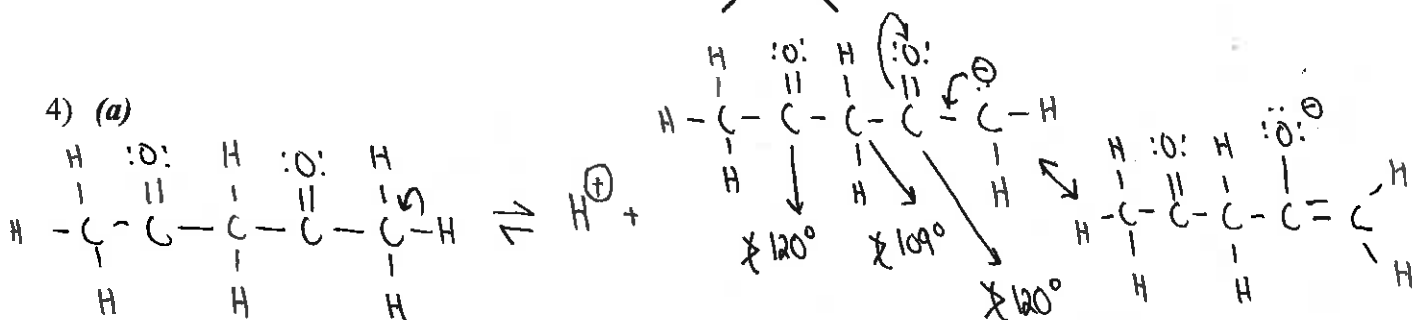
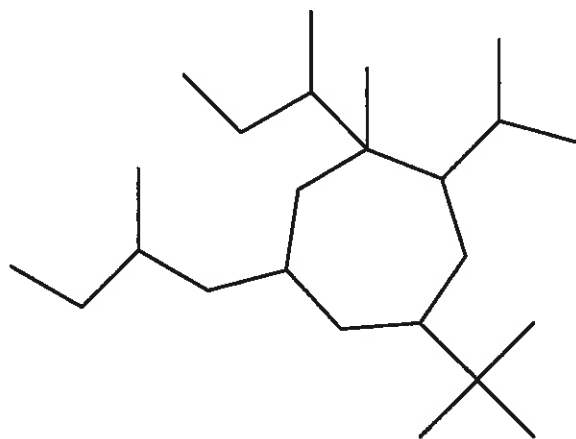
b. Repeat, but instead have **water act as a Lewis base** and **iminium ion A act as a Lewis acid**. Do NOT give the same answer you gave in part a.



## Organic Chemistry Practice Problems

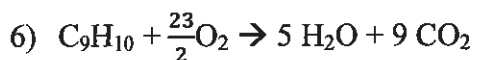
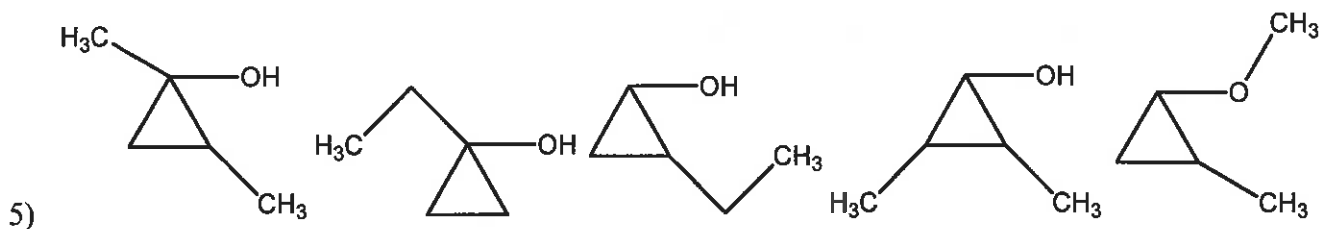
### Organic Chemistry I Answers to Practice Set #3 (Chapters 1-2 - Carey)

- 4-(sec-butyl)-6-ethyl-2,3,6-trimethyl-5-propylnonane
- (a) 5 (b) 6 (c) 1 (d) 9
- This should be the general outline. Show all atoms on your structure.



(c) The secondary H is more acidic. The loss of the secondary H creates the more stable conjugate base (3 resonance structures) which therefore is indicative of the stronger acid. The loss of the primary H creates a conjugate base with 2 resonance structures indicates a less stable conjugate base.

## Organic Chemistry Practice Problems



7) (a) Left (b) Right (c) Right (d) Left (e) Left

8) (a) ii (b) i (c) i (e) iii (f) i (d)

