**Exam 1: February 11, 2015**

**Provide organic products, reagents, and reactants as necessary to complete the following reaction schemes. Note that the reactions may not be balanced.**

**1)**

**2)**

**3)**

**4)**

**5)**

**6)**

**7)**

**Provide the IUPAC name for the following alcohols.**

**8)**

**9)**

**10)**

**Synthetic Puzzles: Fill in the empty boxes with the necessary information to complete the following reaction schemes.**

**11)**

**12)**



**Provide the mechanism for the following reactions. Include any lone pairs and correct formal charges on structures.**

**13)**



**14)**





**15)** For the following spectrum, label the **molecular ion peak** and the **base peak**. Assume that the molecular ion peak is visible in the spectrum for this question. Then write what ***atom*** is present in the molecule based on a common mass spectra pattern(s).



 **SDBSWeb : http://sdbs.riodb.aist.go.jp (National Institute of Advanced Industrial Science and Technology, 2-10-2015)**

**Atom present in the molecule:\_\_Br\_\_\_**

**16)** For the following spectrum of 2-pentanone, label the ***base peak*** and the ***molecular ion peak***. Again assume the molecular ion peak is visible. Then, in the space provided, show the ***ionizati*** ***on or fragmentation pathway*** to produce the peaks at m/z = 86 and m/z = 57.



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**Ionization**

**Fragmentation**



**Grading Rubric for Exam 1 Spring 2015 (54 points total)**

**Questions 1-7 (14 points)**

 **2 points each**

 **Question 2: Missing H on O (-1 point)**

 **Question 6: Extra H (-1 point)**

 **Question 7: Reverse order (-1 point)**

 **Na instead of Li (-1/2 point)**

**Questions 8-10 (6 points)**

 **2 points each**

 **Wrong base name (-1 point)**

 **Errors involving commas or hyphens or parenthesis (-1/2 point each)**

 **Wrong numbering (-1 point)**

 **Wrong alphabetizing (-1 point)**

 **Wrong substituent name (-1 point)**

 **Z vs. E (-1 point)**

 **Note: If the wrong base chain was chosen, apply the last five penalty conditions according to the new base chain.**

**Question 11 (4 points)**

 **2 points per structure**

**Question 12 (4 points)**

 **2 points for the reagents on the first reaction**

 **(-1 point for oxymercuration/demercuration)**

 **2 points for the product of the second reaction**

**Question 13 (10 points)**

 **1 point per arrow (6 points)**

 **2 points for each intermediate (4 points)**

 **Incorrect formal charge (-1 point per structure)**

 **Incorrect lone pairs (-1 point per structure)**

**Question 14 (6 points)**

 **1 point per arrow (4 points)**

 **2 points for the intermediate (2 points)**

 **Incorrect formal charge (-1 point per structure)**

 **Incorrect lone pairs (-1 point per structure)**

**Question 15 (4 points)**

 **Correctly labeled base peak (1 point)**

 **Correctly labeled molecular ion peak (1 point)**

 **Correct atom (2 points)**

**Question 16 (6 points)**

 **Correctly labeled base peak (1 point)**

 **Correctly labeled molecular ion peak (1 point)**

**Correct ionization pathway shown (2 points)**

 **Correct fragmentation pathway shown (2 points)**

 **Notes on Question 16**

**Key Conceptual Features on Ionization and Fragmentation Pathways**

**1) The correct radical cations (from ionization) and fragment cations (from fragmentation) should be shown.**

**Single instead of triple bond (-1 point)**

**Missing radical cation on ionization (-1/2 point)**

**Charge on wrong atom (-1/2 point)**

 **Missing charge (-1/2 point)**

**Cation but no radical (-1/2 point)**

**Only has math for the ion (-1/2 points)**

**2) A pathway is shown which implies a reactant, arrow and product.**

**Ionization pathway not shown (-1 point)**

**Missing fragmentation entirely (-2 points)**

 **Wrong fragmentation pathway (gives wrong fragments) (-2 points)**

 **Fragment in wrong direction (-1 point)**

 **Fragmentation/ Ionization not shown, just structure (-1 point)**

 **Fragment symbol is pointing in the wrong direction for the fragments shown which are correct (-1/2 point)**

 **Missing arrow or equal sign(-1/2 point)**

 **Non-essential components (electrons and radicals) for explaining peaks in spectrum.**

 **2e on left ( - 0 points)**

 **Missing ethyl radical on right (-0 points)**

 **Missing 2e on right (-0 points)**