

Name(s): \_\_\_\_\_

Sec. \_\_\_\_\_

Chem 226/ Dr. Rusay

**Odor, Functions & Structures**  
*Synthesis of Acetates*

**Refer to the following required reading that is on reserve in the DVC library under Dr. R's name.** "Structure-Odor Relationships", Karen J. Rossiter, Chem. Rev., 96, 3201-3240, 1996 (Library Reserve)  
*Reading: pp. 3201-08, 3216-26. Also refer to the Web page below and the table on the last page of the handout with ranges of absorbance frequencies for various types of functional patterns.*

*<http://wwwchem.csustan.edu/Tutorials/INFRARED.HTM>*

1. How many different odor references are there in the International Standard Collection? \_\_\_\_\_
2. Define: a) anosmia:  
b) hyposmia:  
c) hyperosmia:
3. Describe GCO ("GC sniffing") and how it plus your nose could be used to distinguish the stereoisomers in a mixture of d- and l- carvone. What would have to be unique about the stationary phase for the separation to work, and where on the GC would you place your nose near to?
4. Name the three most important types of floral perfume "notes".  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
5. Natural products from flowers produce the wide range of molecules and functions, which account for floral notes. The blossoms from one plant source that accounts for one of the floral notes are too small to produce large quantities of material for perfumes. Four synthetic compounds are used instead.

Name the function that is common to all four: \_\_\_\_\_

What distinctive IR absorbances or "peaks" ( $\text{cm}^{-1}$ ) would be observed in the molecule's spectrum that would be indicative of this function? \_\_\_\_\_

What is a second function that is found in 2 of the 4? \_\_\_\_\_

What distinctive IR absorbances or "peaks" ( $\text{cm}^{-1}$ ) would be observed in the molecule's spectrum that would be indicative of this function? \_\_\_\_\_

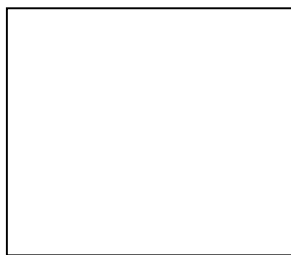
6. Draw a stereochemical structure for Ethyl(1R,6S)-2,2,6-trimethyl-cyclohexane-1-carboxylate.



Which floral note does this molecule produce? \_\_\_\_\_

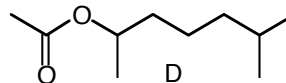
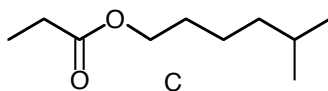
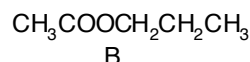
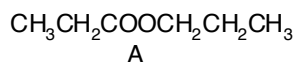
What distinctive IR absorbances or "peaks" ( $\text{cm}^{-1}$ ) would be observed in the molecule's spectrum that would be indicative of this function? \_\_\_\_\_

7. Draw the correct stereochemical structure of the isomer of rose oxide that is ~100x more powerful in its scent than its closest isomer. Label the chiral carbons as R- or S-.

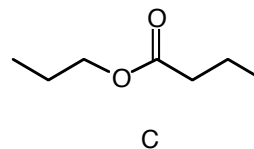
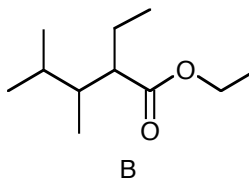
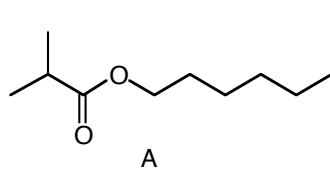


What function is present in all isomers? \_\_\_\_\_  
 What distinctive IR absorbances or "peaks" ( $\text{cm}^{-1}$ ) would be observed in the molecule's spectrum that would be indicative of this function? \_\_\_\_\_

8. Circle the esters that are similar to those being synthesized in the lab (acetates).

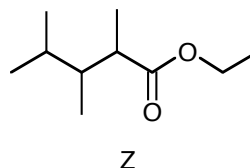
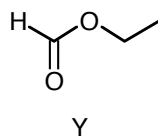
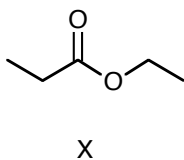


9. Check the box that best describes the respective smell of each of the following esters



	<i>Non-fruity</i>	<i>Fruity</i>	<i>Strongly Fruity</i>
A			
B			
C			

10. Rank the following esters in decreasing order of strength of fruity smell.



\_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_

11. The extract of the cured, full-grown, unripe fruit of an orchid produces a popular flavoring. The compound that is responsible for the smell/flavor is 4-hydroxy-3-methoxybenzaldehyde. The Guinness Book of World Records once listed this compound as having the lowest smell detection limit of all chemicals ( $2 \times 10^{-11}$  g per  $1,000 \text{ cm}^3$  of air). Draw its structure below, provide its common name and list its functions with the corresponding distinctive IR absorbances or “peaks” ( $\text{cm}^{-1}$ ) in the molecule’s spectrum that would be indicative of each of the functions.

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The natural extract sells for  $\sim \$1500/\text{kg}$  versus  $\sim \$20/\text{kg}$  for the synthetic version. Professionals like those in DVC’s baking and pastry program will only use the natural. Why do you think that this is the case? (BTW: They ONLY use real butter as well! Their shop is located in the cafeteria and is open M-Th. Thursday afternoon they sell everything that they have left real cheap.)

*Extra Credit:*

The space (volume) of the Oakland Coliseum Arena, aka *Network Associates Coliseum*, is approximately  $90,000,000 \text{ ft}^3$ . If  $1.00 \text{ g}$  of 4-hydroxy-3-methoxybenzaldehyde were released at center court, and was completely and evenly dispersed throughout the building, would you smell it sitting in sec. 204, row H, seat 121? Show your calculation. ( $1 \text{ ft}^3 = 0.0283 \text{ m}^3$ )

