

Moorpark College Chemistry 11
Spring 2008

Instructor: Professor Torres

Examination #3: Section Three
March 13, 2008

Name: _____ (print)

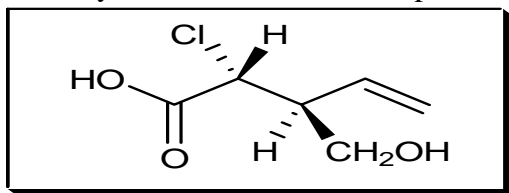
Name: _____ (sign)

*alkene < alkyne < amine < alcohol < ketone < aldehyde < amide < acyl halide < ester
< carboxylic acid*

Directions: Make sure your examination contains NINE total pages (including this cover sheet) when instructed to do so. For the first portion of this exam, select the best answer choice and mark the answers on your scantron. Then answer the free response questions that follow using the space provided (100 pts. total; multiple choice 2 pts. each).

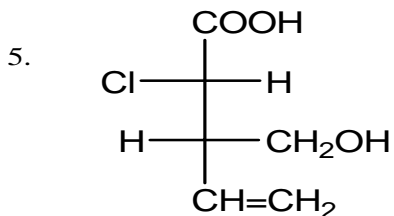
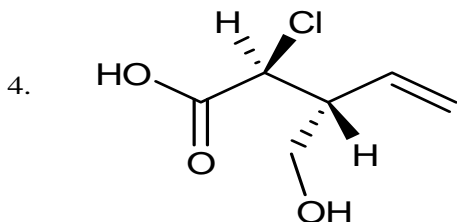
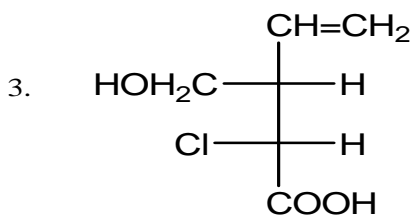
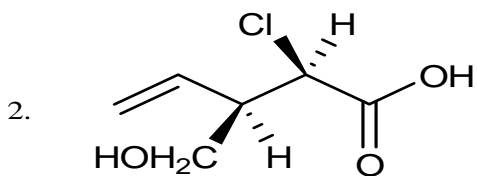
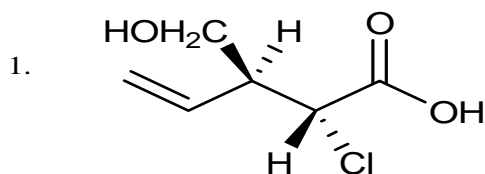
Question	Points
1. – 15. (30 pts.)	
16. (41 pts.)	
17. (14 pts.)	
18. (15 pts.)	
TOTAL (100 points)	

For Questions 1 – 5, behold the molecule *sweatchlorhydroxylic acid*, a drug recently synthesized by nursing chemistry students in order to help alleviate examination stress:



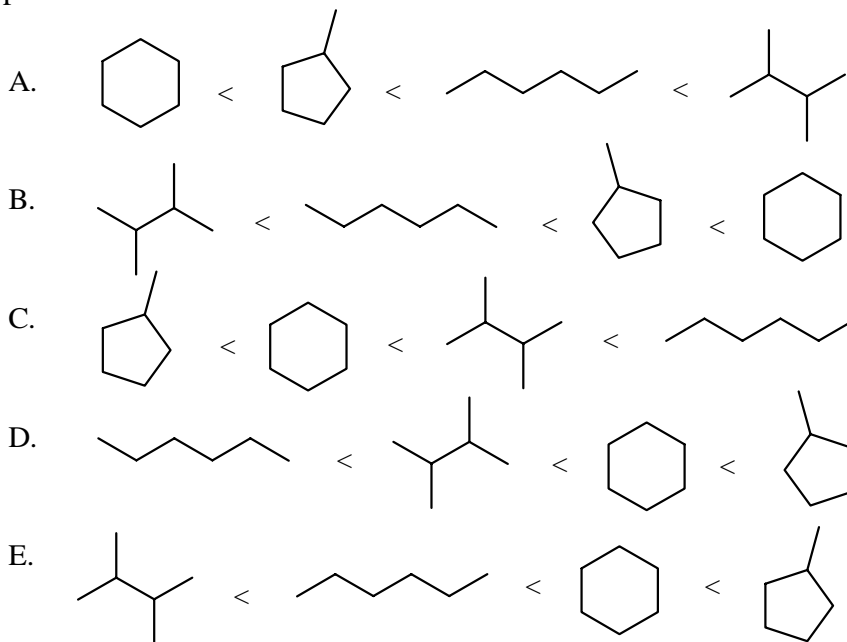
Determine the relationship (if any) that exists between the listed molecules below relative to *sweatchlorhydroxylic acid* by selecting one of the following answer choices:

- A. Identical structure
- B. Constitutional isomer
- C. Enantiomer
- D. Diastereomer
- E. No relationship



For Questions 6 – 8, select the best answer choice below.

6. Which of the following is arranged in order of expected INCREASING boiling point?



7. Determine the INCORRECT statement about configurational isomers:

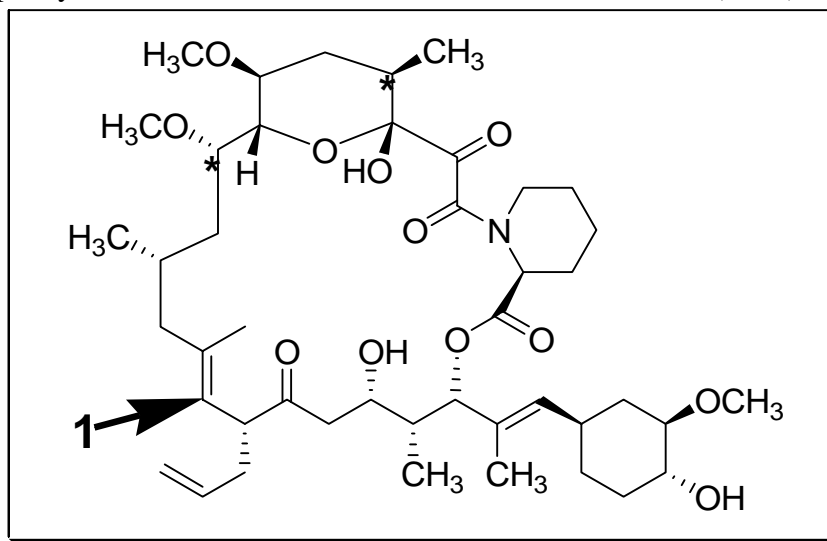
- A. A pair of enantiomers rotates plane polarized light by equal amounts in opposite directions.
- B. Enantiomers have identical melting points, boiling points, solubilities, heats of formation, standard free energies, and densities.
- C. Diastereomers are not mirror images of each other.
- D. In describing the direction of light rotation, a plus sign (+) refers to dextrorotatory, and a minus sign (-) refers to levorotatory.
- E. Dextrorotatory rotation is generally used to describe an enantiomer with an R- absolute configuration.

8. How many constitutional isomers are possible for the molecular formula C_3H_8O ?

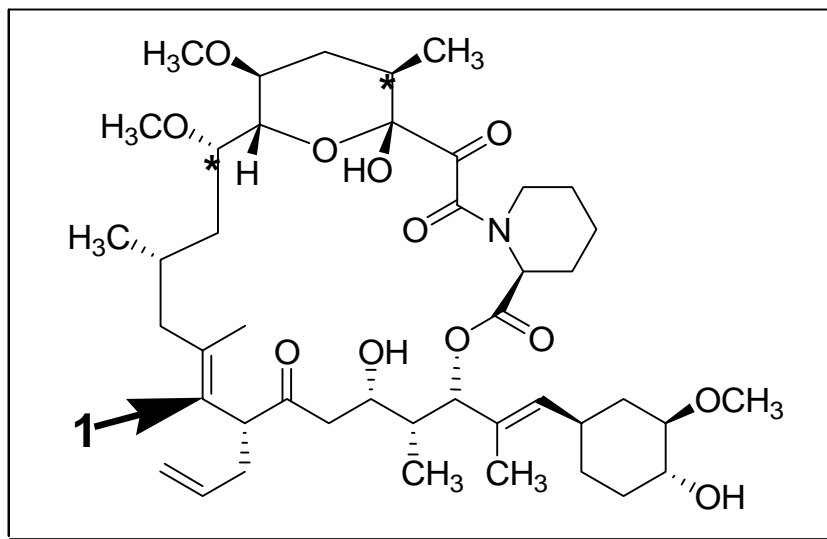
- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

For Questions 9 – 15, select “A” for all TRUE responses, and “B” for all FALSE responses.

9. In a Fischer projection, the molecule is first arranged with the horizontal bonds to its chiral center projecting behind the plane of the page, and the vertical bonds project above the page.
10. *Captopril* is not sold as a racemic mixture by the FDA; rather, it is sold as the (S, S)-enantiomer.
11. A tertiary carbocation is much less stable than a primary carbocation.
12. A secondary amine contains one N-H bond.
13. A racemic mixture is an equimolar mixture of one enantiomer and one diastereomer.
14. While both enantiomers of thalidomide are active sedatives, the S-enantiomer was found to be teratogenic.
15. *Ibuprofen* is commercially sold as a racemic mixture, although the S-enantiomer acts as a pain and fever reliever.
16. (41 pts. total) Consider the structure of the immunosuppressant *FK-506*, a molecule shown to disrupt calcineurin-mediated signal transduction in T-lymphocytes as described in *Curr. Med. Chem.* **7**: 731-748 (2000).



- A. (4 pts.) What is the molecular formula of this immunosuppressant (e.g. $C_{20}H_{30}O$)?

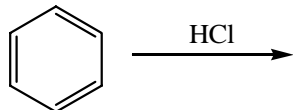


- B. (3 pts.) How many total stereocenters are present in *FK-506*? Determine the maximum number of stereoisomers possible.
- C. (6 pts.) Identify and label SIX DIFFERENT functional groups in the structure above.
- D. (4 pts.) Now consider the two carbons labeled with an asterisk (*) above. Determine the absolute configuration of each potential chiral center above by assigning an R or S.
- E. (3 pts.) *FK-506* has been shown to exhibit moderate solubility in various organic solvents. Is this immunosuppressant expected to be soluble in ethanol ($\text{CH}_3\text{CH}_2\text{OH}$)? Briefly explain why or why not.
- F. (4 pts.) Consider the carbon atom labeled "1". What is the geometry AND approximate bond angle of this carbon atom?

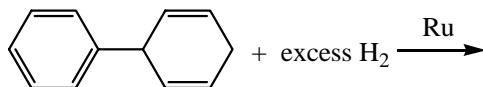
- G. (8 pts.) Draw both chair conformations of the cyclohexane portion of *FK-506*, and label the MOST STABLE chair conformation using “R” for the largest substituent. Briefly explain your choice. (HINT: only ONE cyclohexane component readily undergoes a chair flip).
- H. (2 pts.) Are there any aromatic components present in *FK-506*? If so, circle them in the structure on the prior page. If not, write NONE.
- I. (4 pts.) Determine whether or not *FK-506* is expected to undergo the following reactions. Write “Y” for YES or “N” for NO along each line below:
- 1) _____ halogenation
 - 2) _____ hydration
 - 3) _____ hydrohalogenation
 - 4) _____ hydrogenation
- J. (3 pts.) Patients taking *FK-506* have reported several side effects from this medication including headaches, nausea or diarrhea, and slight shaking. Would you expect for the enantiomer of this drug to result in the same side effects? Briefly explain why or why not.

17. (14 pts. total) **REACTIONS AND MECHANISMS!** Predict the MAJOR product for the reactions listed below, and give the appropriate curved arrow notation where requested. Write NR if no reactions occurs.

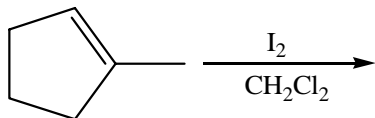
A. (2 pts.)



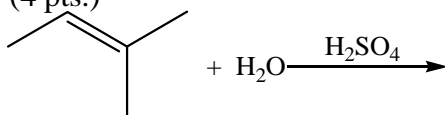
B. (2 pts.)



C. (2 pts.)

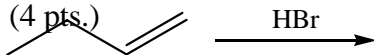


D. (4 pts.)



mechanism:

E. (4 pts.)



mechanism:

18. (15 pts. total; 3 pts. each) **NOMENCLATURE!** Use the appropriate IUPAC notation to name/draw each of the organic structures below:

A. 6-propyl-4-decyne

