Organic Chemistry Practice Problems

Organic Chemistry I Practice Set #9 (Chapters 7 – Carey)

1) For each of the given compounds, provide a name. Use stereochemistry appropriately.

(a) [Chemical structure image]
(b) [Chemical structure image]
(c) [Chemical structure image]
(d) [Chemical structure image]
(e) [Chemical structure image]

2) For this problem, consider the structural formula given in problem 1e.
(a) Does it represent a D or L sugar?
(b) Represents: (i) aldopentose; (ii) aldohexose; (iii) ketopentose; (iv) ketohexose?
(c) Give a Fischer projection of it in standard orientation for a sugar.
(d) Give a Fischer projection of a compound that is an epimer of compound 1e and a D sugar.
(e) Give a Fischer projection of a compound that is an epimer of compound 1e and a L sugar.
(f) Give a Fischer projection of a compound that is a diastereomer, but not an epimer of compound 1e and a D sugar.
(g) Same as above, make it a L sugar.
(h) Give a Fischer projection of the compound that is the enantiomer of compound 1e.

3) Describe the relationship of each pair of molecules: (a) same molecule (b) constitutional isomers (c) diastereomers (d) enantiomers

(a) [Chemical structure image]
(b) [Chemical structure image]
(c) [Chemical structure image]
(d) [Chemical structure image]
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4) Fill in what is missing. Either give all of the missing reagents to complete the reaction or give a structural formula for the major organic product(s). Show stereoisomers properly if necessary. If no reaction occurs, write N.R. Each starting compound is the pure stereoisomer shown.

(a) \[ \text{Br} \quad \text{KOC(CH}_3\text{)}_3\text{(CH}_3\text{)}_2\text{COH} \rightarrow \quad ? \]

(b) \[ \quad \text{Br}_2 \rightarrow \quad ? \]

(c) \[ \text{CH}_3\text{CO}_2\text{H} \rightarrow \quad ? \]

(d) \[ 1. \text{H}_3\text{B} + \text{O} \]

\[ 2. \text{NaOH, H}_2\text{O}_2 \rightarrow \quad ? \]

(e) \[ \text{Cl}_2 \rightarrow \quad ? \]

(f) \[ \text{Br}_2 \rightarrow \quad ? \]

5) Using arrows to show the flow of electrons, write a stepwise mechanism for each of the following reactions. Show clearly how the final stereoisomeric products are formed.

(a) \[ \text{Br}_2 + \text{H}_2\text{O} \rightarrow \quad \text{CH}_2\text{CH}_3 \quad \text{OH} + \text{CH}_2\text{CH}_3 \quad \text{CH}_3 \]

(b) \[ \quad \quad \quad \text{Br}_2 + \text{H}_2\text{O} \rightarrow 0.5 \quad \text{OH} + 0.5 \quad \text{CH}_3 \text{Br} \]

IMPORTANT NOTE for above problem! If there is a mixture of isomers for the major product, put both. Write “equal” if they are formed in equal amounts and “unequal” if they are formed in unequal amounts.

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Adapted from practice handouts created by Dr. EF Hilinski of Florida State University
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1a) (2R,3S)-2-(bromomethyl)-2,3-diethyloxirane 1b) (2S,3R)-2,3-dimethylpentane-1,3-diol
1c) (2S,3R,5S)-2,3-epoxy-1,1,5-trimethylcyclohexane 1d) (4R,5R)-4,5-dibromo-3-ethyl-3,6,6-trimethyloctane
1e) (2R,3S,4R,5R)-2,3,4,5,6-pentahydroxyhexanal

2a) D sugar 2b) ii 3a) iv 3b) iii 3c) i 3d) iv

4a) 
4b) 
4c) 
4d) 
4e) 
4f) 
4g) 
4h) 
4i) 
4j) 
4k) 
4l) 

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5a) 1) ... → 0.5 ...

2) ...

2') Bond B' are enantiomers
Steps 2 and 2' are nucleophilic attack steps

3) Proton-transfer to create alcohol :Br:
Both B and B' undergo ...
I will only show one ...

3b) 1) ...

2) ...

2') - enantiomers

3) ...

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