

Test 3

Chemistry 2321

April 25, 2003

McMurry, Chapters 9-11

103 Total Points

Name _____

Please Print

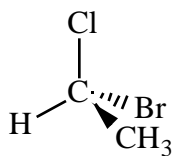
Part I. Multiple choice. (4 points each.) Choose the one best answer and mark your answer on the ScanTron sheet.

1. Which of the compounds below is/are chiral?

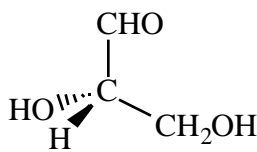
- I. *cis*-1,3-dichlorocyclohexane
- II. *trans*-1,3-dichlorocyclohexane
- III. *cis*-1,4-dichlorocyclohexane
- IV. *trans*-1,4-dichlorocyclohexane

- a) I and III
- b) II and IV
- c) I and II
- d) III and IV
- e) II only

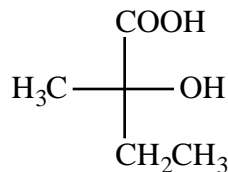
2. Which of the compounds below should be designated with an S configuration?



I



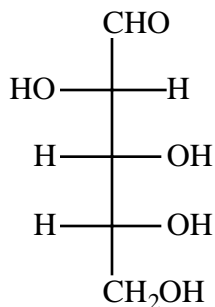
II



III

- a) I
- b) II
- c) III
- d) I and II
- e) I, II, and III

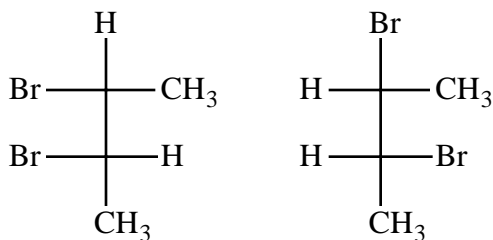
3. The carbohydrate D-Arabinose has the following Fischer projection:



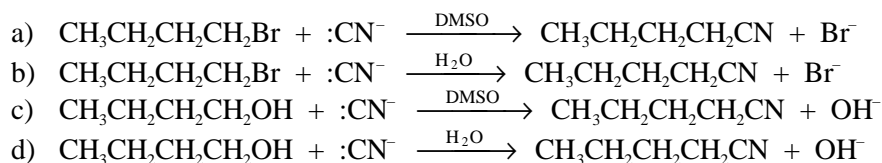
Assign an R or S configuration to the three chirality centers in D-arabinose.

- a) (2S, 3R, 4R)
- b) (2S, 3S, 4R)
- c) (2R, 3R, 4S)
- d) (2R, 3R, 4R)
- e) (2R, 3S, 4S)

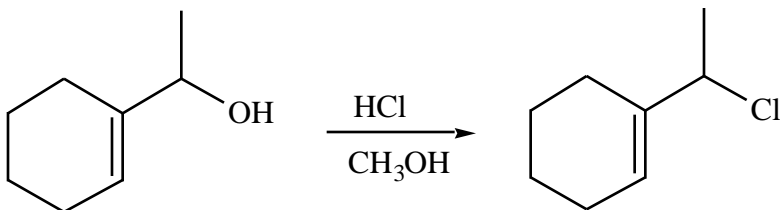
4. What is the relationship between the two structures shown below:



- identical and meso
 - identical, but not meso
 - diastereomers
 - enantiomers
 - constitutional isomers
5. Which of the reactions below is the fastest?



6. Which term below best describes the mechanism of the following reaction?



- $\text{S}_{\text{N}}1$
 - $\text{S}_{\text{N}}2$
 - E1
 - E2
 - Free Radical Halogenation
7. Consider the reaction of *trans*-2-butene with Br_2 in CH_2Cl_2 . Which statement concerning this reaction is correct?
- This product is optically active because it possesses two chirality centers.
 - This product is optically inactive because it is a racemic mixture of enantiomers.
 - This product is optically inactive because it is meso.
 - This product is optically inactive because it does not possess any chirality centers.
 - This product is optically inactive because it is a racemic mixture of diastereomers.

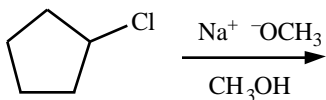
8. Which of the following alkyl halides would be expected to react the fastest under $\text{S}_{\text{N}}2$ conditions?

- 1-bromo-2-methylbutane
- 2-bromo-2-methylbutane
- 2-bromo-3-methylbutane
- 1-bromo-3-methylbutane

9. Which alkyl halide is expected to react the fastest under S_N1 conditions?

- $(CH_3)_3Cl$
- $(CH_3)_3CBr$
- $(CH_3)_3CCl$
- $(CH_3)_3CF$
- They would all react at the same rate.

10. What is the best description of the mechanism of the reaction below?



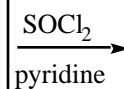
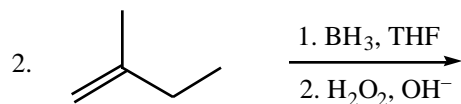
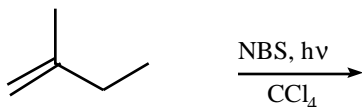
- free radical halogenation
- S_N1
- S_N2
- E1
- E2

Part I Answer Key

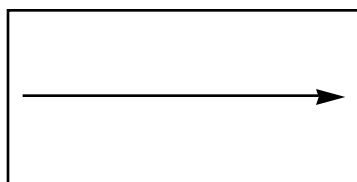
- e
- d
- a
- d
- a
- a
- c
- d
- a
- e

Part II. Reactions. Draw the reactant, product, or reagents as indicated. Clearly indicate the regiochemistry and stereochemistry when appropriate. (Question 1 is worth 6 points; each box is worth 4 points.)

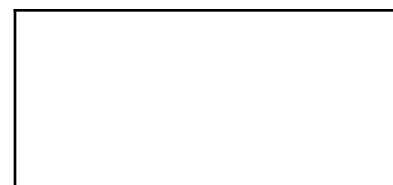
1. Draw all possible products for the following reaction:



3. $CH_3CH_2CH_2CH_2OH$



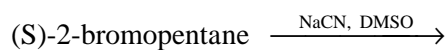
$CH_3CH_2CH_2CH_2Br$





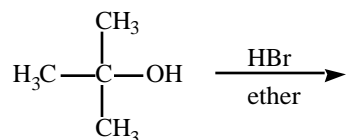
Part III. Mechanisms. (5 points each.)

1. Draw the complete mechanism for the reaction below:



2. Show the complete mechanism for the reaction of 1-butene with HBr in ether, *paying particular attention to the stereochemistry of the transition state and product(s)*. Use curved arrows to indicate each bond broken and each bond formed. Name the product or products.

3. Show the complete mechanism for the reaction below:



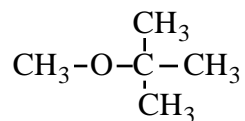
Part IV. Synthesis. (5 points each.) Show how the following syntheses could be performed. More than one step may be required. Show all reagents and all intermediate compounds in your synthetic scheme.

1. Starting with cyclohexane, show how butylcyclohexane could be synthesized.

2. Starting with cyclopentene, show how 1,3-cyclopentadiene could be synthesized.

Part V. Short Answer. (4 points each.)

1. Ethers can often be prepared by the S_N2 reaction of alkoxide ions, RO^- , with alkyl halides. Suppose you wanted to prepare methyl t-butyl ether, shown below:



Draw the structure of the alkyl halide and the alkoxide ion that could be used to prepare this ether.

2. A newly isolated natural product was shown to be optically active. If a solution was made by dissolving 5.00 g of the natural product in 20.0 mL of ethanol and was then placed in a sample tube with a 1.00 dm tube, the observed rotation was found to be -12.43° . What is the specific rotation of this natural product?

3. Draw as many resonance structures as you can for the benzylic carbocation, shown below.

