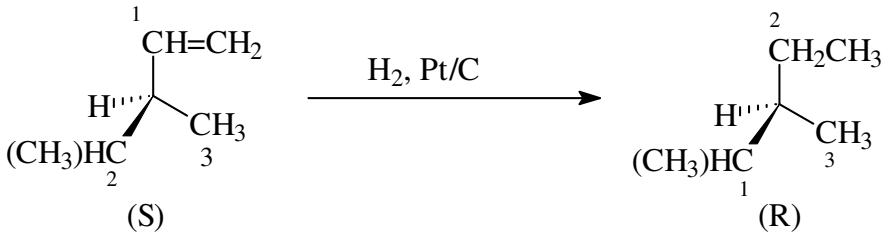
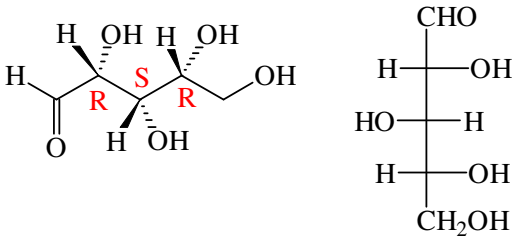
Chapter 7-9 Problems

1. Consider the compound **(*S*) 3,4-dimethyl-1-pentene**. Upon reduction with H_2 on a 1% Pt/C catalyst, the resulting product is pure **(R) 2,3-dimethylpentane**. Draw the equation for this reaction, *clearly* drawing the starting alkene and the product alkane and explain why the absolute configuration is completely inverted in this reaction. It is inverted because the priorities change. In the reactant alkene, the vinyl group is #1, the isopropyl is #2; whereas in the product, the ethyl group in the product is #2 and the isopropyl is #1.



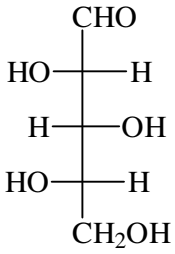
2. D(+)-Xylose is shown below and has an $[\alpha]_D = +92^\circ$.



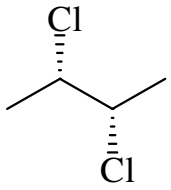
a) Determine the absolute configuration of each asymmetric center.
See above.

b) Draw D(+) xylose in a Fischer projection with the aldehyde on top and the primary alcohol on the bottom. See above.

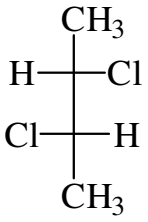
c) Draw L(-) xylose in a Fischer projection next to D(+)-xylose above. What is its specific rotation? -92°



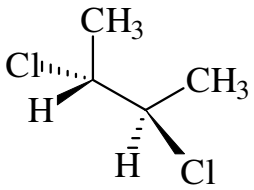
3. Determine the stereochemical relationship (enantiomers, diastereomers or identical) between compounds A & B; A & C; and B & C. Also determine the absolute configuration of each chiral center. Which one(s) is (are) optically inactive?_____



A



B



C

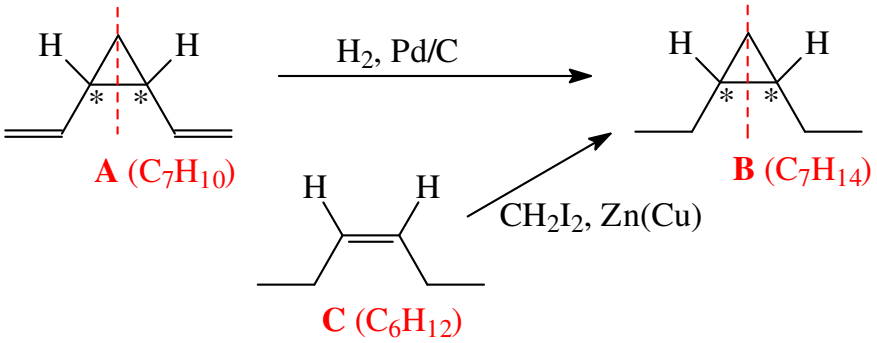
Stereochemical relationships

A & B identical (both S,S)

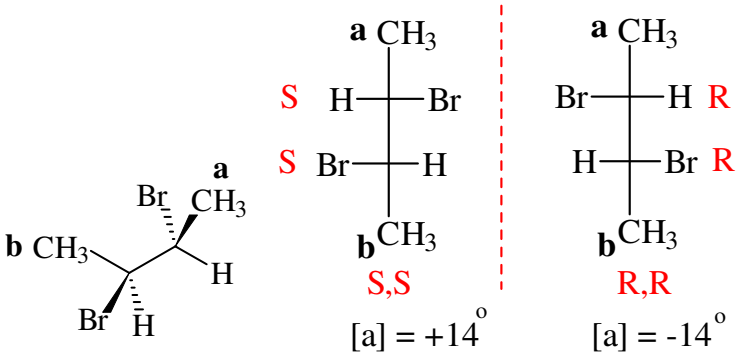
A & C enantiomers (C is R,R)

B & C enantiomers (C is R,R)

4. An unknown hydrocarbon **A (C_7H_{10})** undergoes a standard catalytic hydrogenation to give **B (C_7H_{14})**. Upon treatment of compound **A** with H_2 on Lindlar's catalyst, there is no reaction. Hydrocarbon **C (C_6H_{12})** can be used to prepare **B** using CH_2I_2, Zn(Cu). Compounds **A** and **B** both have 2 asymmetric centers and both are meso. Identify **A**, **B**, and **C** and show your thought processes.



5. The compound below has a [α] = +14°. Draw the compound in a Fischer projection with the methyl group **a** on the top and **b** on the bottom. Draw a stereoisomer of this compound (Fischer) that has the same melting point and density as the compound shown. In what physical property do your two stereoisomers differ? They have equal but opposite specific rotations. They also probably have different odors. What is the stereochemical relationship? They are enantiomers.



6. An unknown hydrocarbon **A** has a molecular formula of C_8H_{16}. Hydrogenation of **A** with H_2, Pt/C gives compound **B** with a formula of C_8H_{18}. Cyclopropanation of **A** with CH_2I_2, Zn(Cu) gives a compound **C**, C_9H_{18}. Both **B** and **C** have 2 asymmetric centers and are *meso*. Additionally, ozonolysis of **A** affords only 2-butanone. Propose structures for **A**, **B**, and **C** that are consistent with these data.