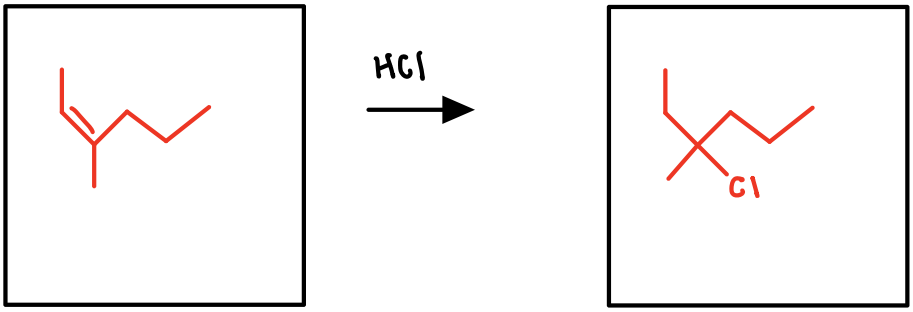
Polytechnic Tutoring Center

Midterm II REVIEW ANSWER KEY– CM2213, Fall 2021

Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.

Problem 1

a) Draw the structure of (Z)-3-methylhex-2-ene in the box. Next, draw the structure of the Markovnikov product that forms when this alkene is reacted with HCl.



b) Which of the following statements are TRUE about the Markovnikov Product from part a? Circle all that apply.

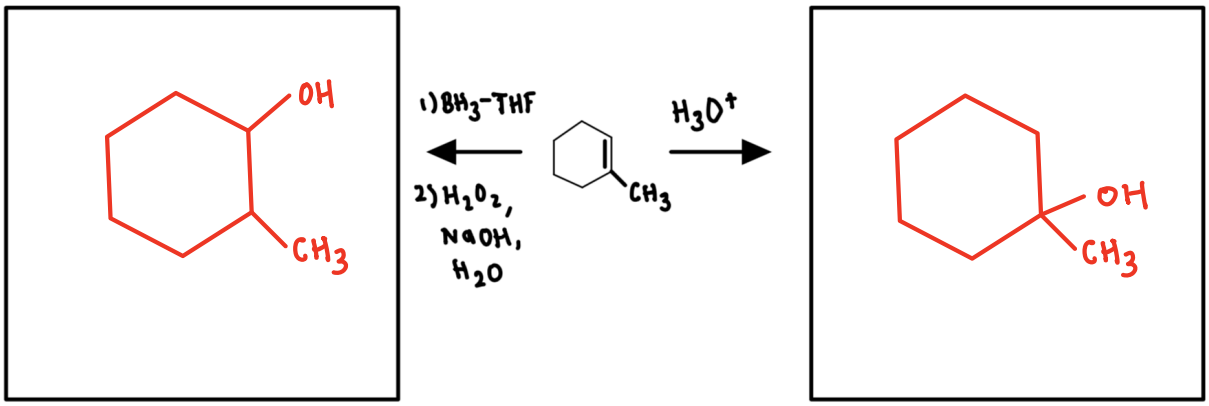
a. The product does not have any stereocenters.
b. The product is formed as a racemic mixture.
c. The optical rotation of the product will be 0°C.
d. The product is a meso compound.
e. The product is the (R)-enantiomer, and its optical rotation is (+).

c) Would your answer to part b) be the same if you were looking at the product of the reaction of (Z)-3-methylpent-2-ene + HCl? Explain.

No! (a) would be true
(c) would be false

Problem 2

Draw the final product of each reaction in the box provide, then answer the stereochemistry questions.



# of stereocenters: 2 Total # of Stereoisomers: 4	# of stereocenters: 0 Total # of Stereoisomers: 1

Problem 3

Structure Identification Problem:

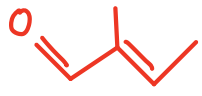
Mass Spec: 98 m/z (M+°)

IR (diagnostic peaks only): 1631, 1700, 2717, 2895, 2980, and 3012 cm-1.

13C NMR: 8.8, 14.3, 22.4, 139.6, 151.0, and 195.1 ppm

1H NMR: 10.1 (singlet, 1H), 6.4 (triplet 1H), 2.1 (singlet 3H), 2.0 (pentet 2H), 1.1 (triplet 3H) ppm

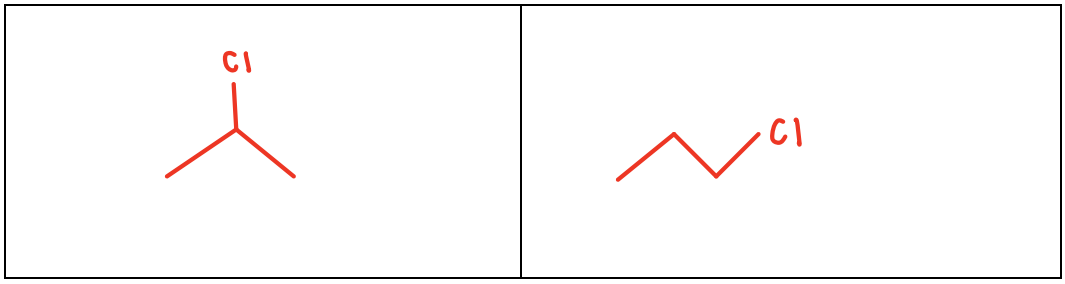
What is the structure of this compound (draw the line structure)?



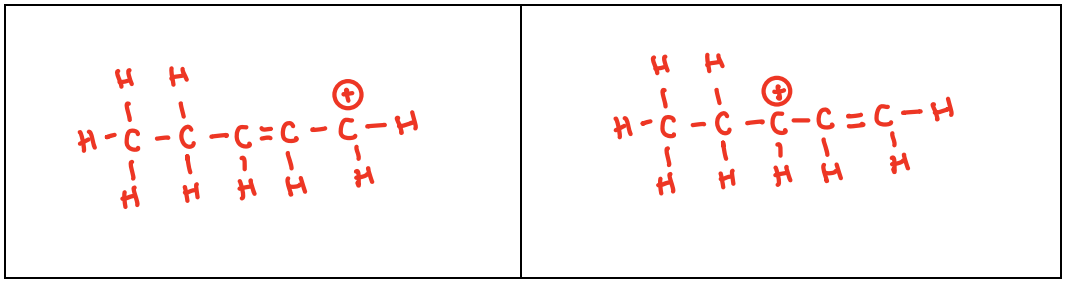
Problem 4

Draw a compound in each box that fits the criteria given.

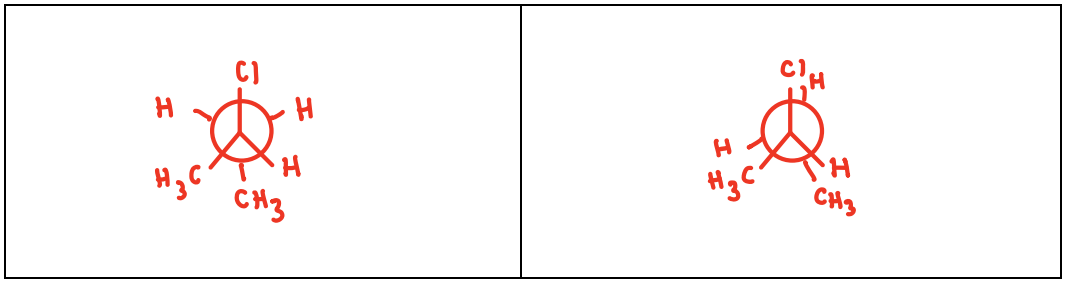
A) A pair of **regioisomers, C3H7Cl:**



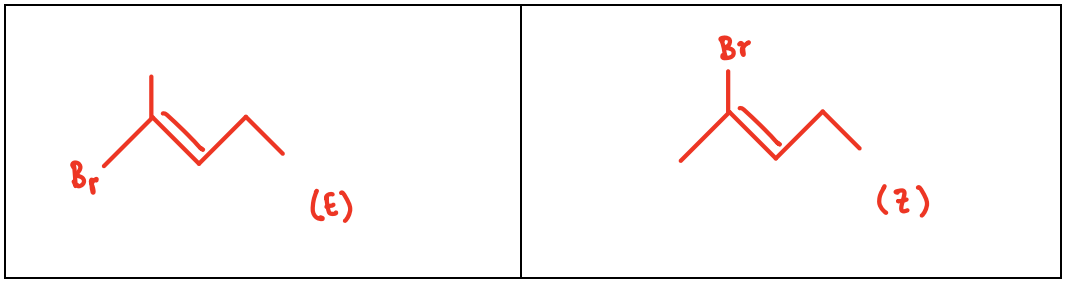
B) Two **resonance forms**, C5H9+



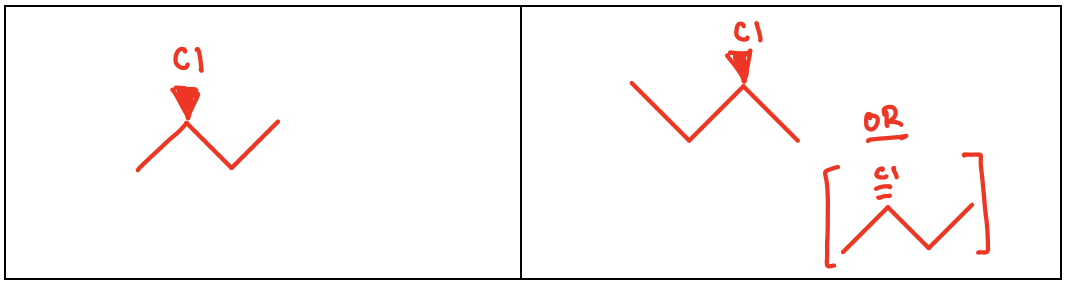
C) Two **conformations** of 2-chlorobutane looking down the C2-C3 bond



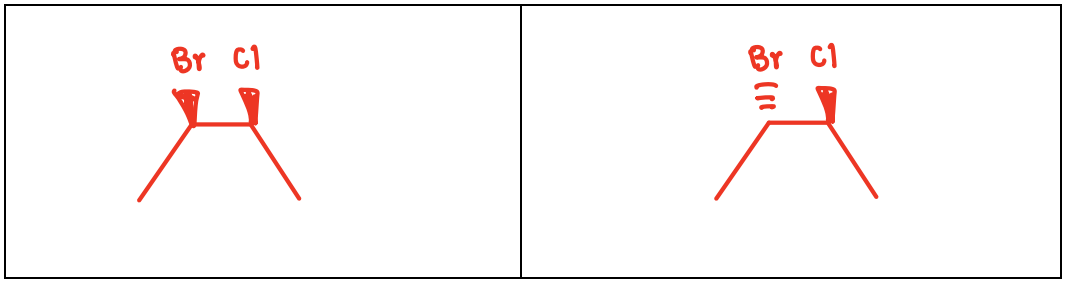
D) **(E) and (Z) isomers,** C6H11Br



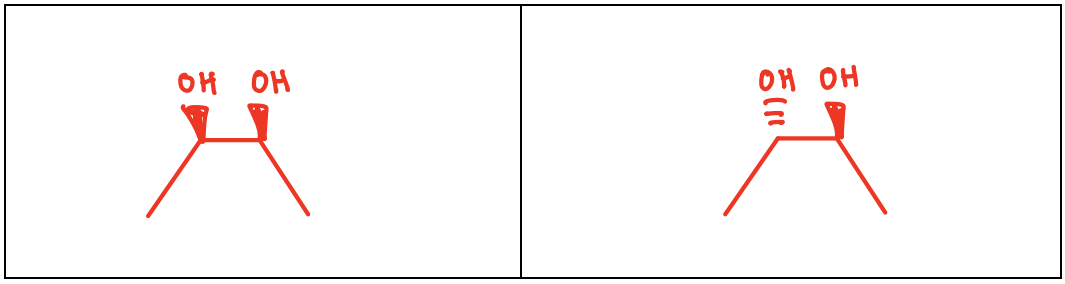
E) A pair of **enantiomers** (use dashes/wedges), C4H9Cl



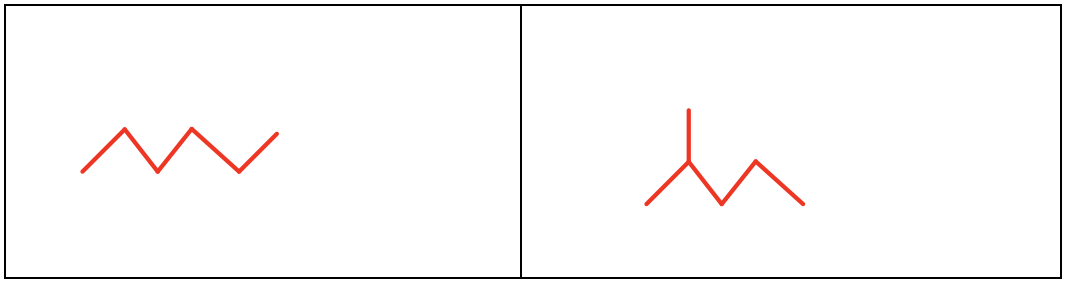
F) A pair of **diastereomers** (use dashes/wedges), C4H8BrCl



G) A **meso compound** and a **chiral diastereomer** (use dashes/wedges), C4H10O2



H) Two **achiral constitutional isomers,** C6H14



Problem 5

Draw a complete arrow-pushing mechanism for the reaction of 1,3-butadiene with HBr to produce **(E)-1-bromobut-2-ene.** Include all lone pairs and non-zero formal charges.