

Names of all students (please print) _____

Answer Key

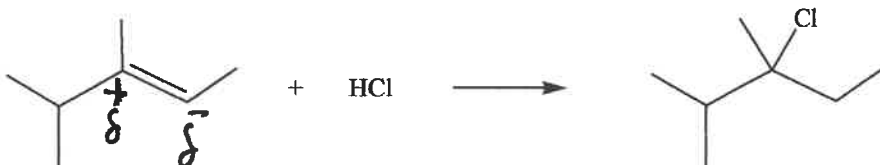
CHEM 243 Organic Chemistry I

Points _____ (10 max)

Worksheet #25: November 22, 2021. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on ONE sheet and turned in for a group grade. All the problems on this worksheet are Review Questions for Exam III.

NOTE: The problems on Worksheets 24-28, and on the Study Guide for Exam IV, will be representative of the problems that might appear on the optional make-up exam.

(1) **Electrophilic Addition Reactions: General Mechanism Questions (video 8-1).** Answer the following questions based on the reaction drawn at the right:



(a) Label one reactant sp^2 carbon as partial positive (δ^+) and the other as partial negative (δ^-).

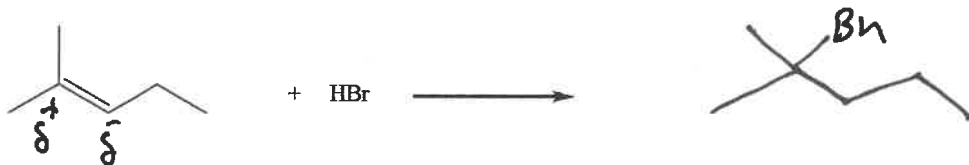
(b) **Circle** the correct responses:

- The H^+ ion becomes bonded to the (δ^- or δ^+) sp^2 carbon
- The H^+ ion is referred to as the (nucleophile, **electrophile**, acid, base)

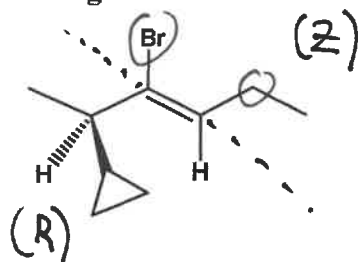
(c) **Circle** the correct responses:

- The Cl^- ion becomes bonded to the (δ^- or δ^+) sp^2 carbon
- The Cl^- ion is referred to as the (**nucleophile**, electrophile, acid, base)

(2) **Electrophilic Addition Reactions.** Based on the analysis you did in problem (1), complete the **Electrophilic Addition Reactions** shown below by drawing the structure of the major, neutral organic products. It is NOT necessary to balance these reactions or write the mechanism. There are NO rearrangements and NO intramolecular reactions.



(3) Nomenclature. Write the IUPAC name for the structure drawn below. Don't forget to include the proper 3D configuration at each chiral carbon (using R/S designations), and proper alkene geometry (cis/trans or E/Z).



(Z)-(R)-3-bromo-2-cyclopropyl-3-hexene

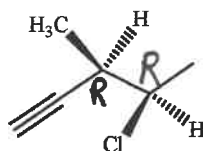
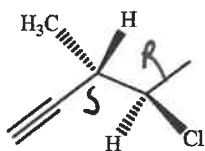
(4) Comparing Organic Structures. How are the following pairs of molecules related?

Identical

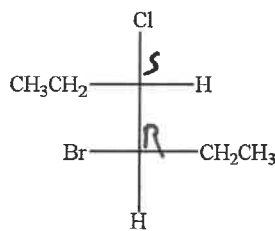
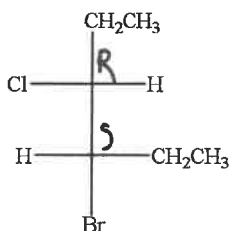
Constitutional isomers

Enantiomers

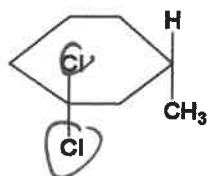
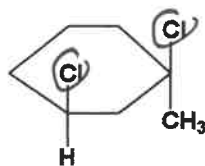
Diastereomers



Diastereomers



Enantiomers



Constitutional

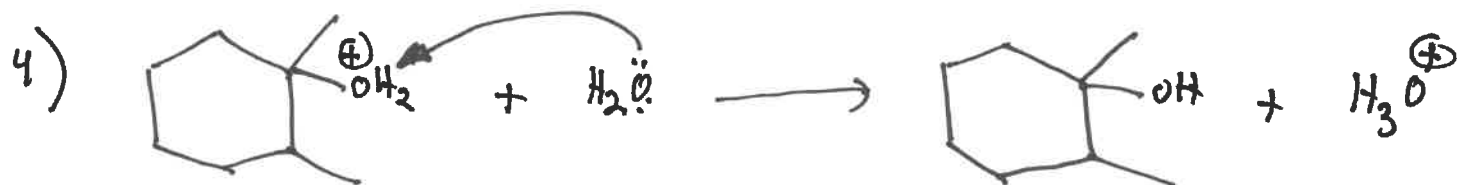
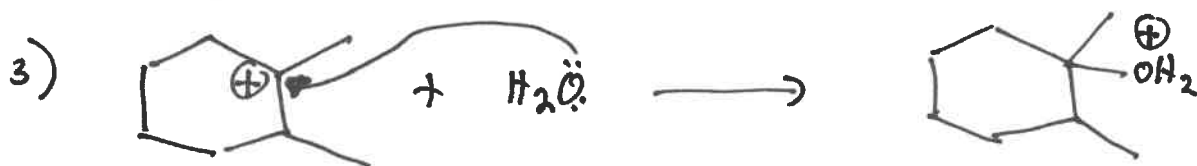
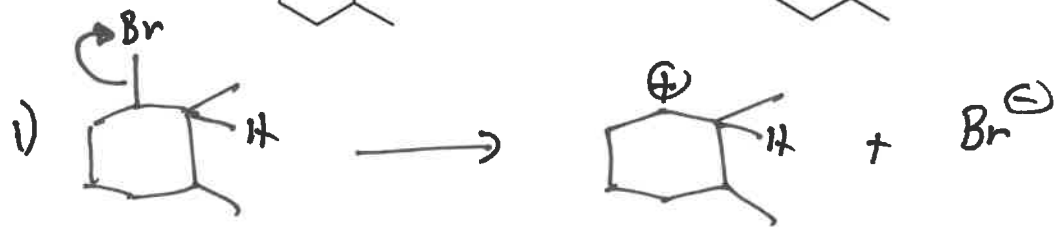
(3) SN1 Mechanism with Rearrangement (4 steps). Write a complete mechanism that explains the formation of all products in the balanced net reaction shown below. Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement.



Keys to Carbocation Rearrangement Mechanisms:

- ✓ Carbocation rearrangements can only occur in SN1 and E1 reactions.
- ✓ Rearrangements occur when a 2° carbocation forms adjacent to a 3° (or 4°) carbon.
- ✓ The "rearrangement" involves an adjacent 3°H or 3°CH₃ (whichever is smaller) "shifting" to the 2° carbocation, forming a more stable 3° carbocation.
- ✓ IMPORTANT – The carbocation does not move! When an 3°H or 3°CH₃ shifts, the original 2° carbocation is extinguished, and a new 3° carbocation forms.

(Continued) SN1 Mechanism with Rearrangement (4 steps):



EXPLAIN what is happening in Step #4 of your mechanism. Be specific!

In step #4, H_2O acts as a base to grab a proton from the intermediate, giving the neutral product and H_3O^+ .