

Names of all students (please print) Answer Key

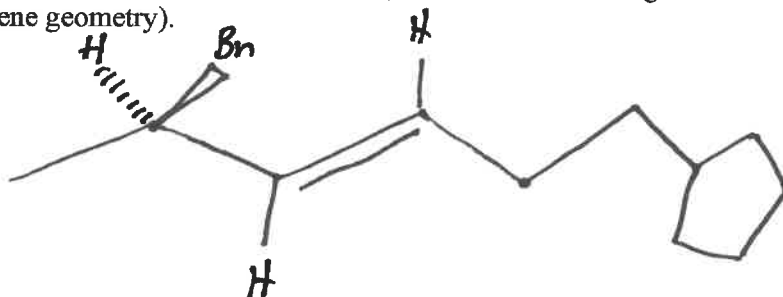
CHEM 243 Organic Chemistry I

Points _____ (10 max)

Worksheet #23: November 10, 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.**

(1) Review: Nomenclature. For the name given below, draw an accurate zig-zag structure (remember to use wedge and dash bonds for all chiral carbons, and draw the proper alkene geometry).

trans-(R)-2-bromo-6-cyclopentyl-3-hexene



(2) Which nucleophile in each pair will react faster in SN2 reactions? Circle one choice in each pair.

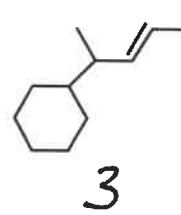
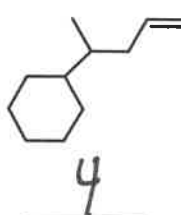
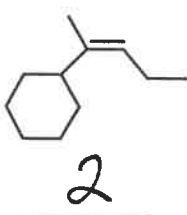
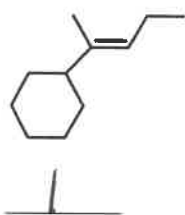
CH₃S⁻ or (CH₃)₃CS⁻

H₃P or NH₃

Br⁻ or AsH₂⁻

PH₂⁻ or PH₃

(3) Rank the following alkenes based on their relative stabilities (1 = most stable and 4 = least stable).



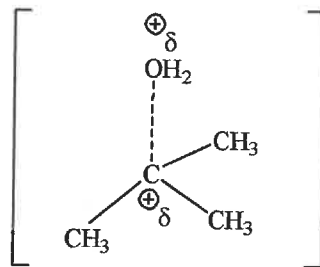
(4) The transition state structure shown at the right is most consistent with which type(s) of mechanism(s)? Circle your choice(s).

E2

E1

SN1

SN2

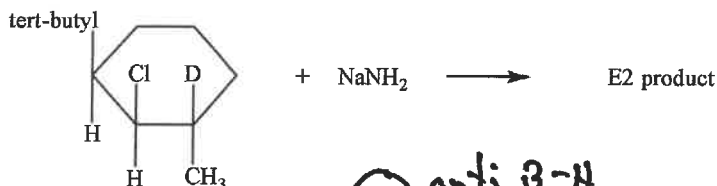


(5) Explain what is happening in the mechanism step leading to the transition state in problem (4), including what products are in the process of being formed in this step.

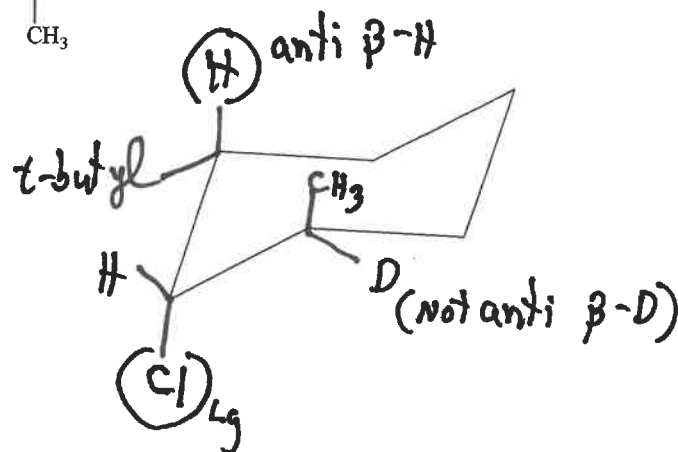
This ts shows the lg (H₂O) leaving to form a carbocation intermediate.

(6) Review: E2 Elimination Stereochemistry.

Consider the E2 elimination reaction of this cycloalkyl chloride using NaNH_2 . "D" represents deuterium, an isotope of hydrogen.

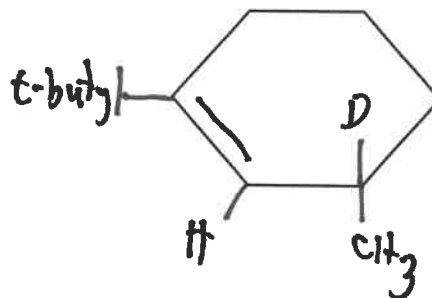


(a) Draw the most stable chair conformer for the cycloalkyl chloride reactant using the template drawn at the right:

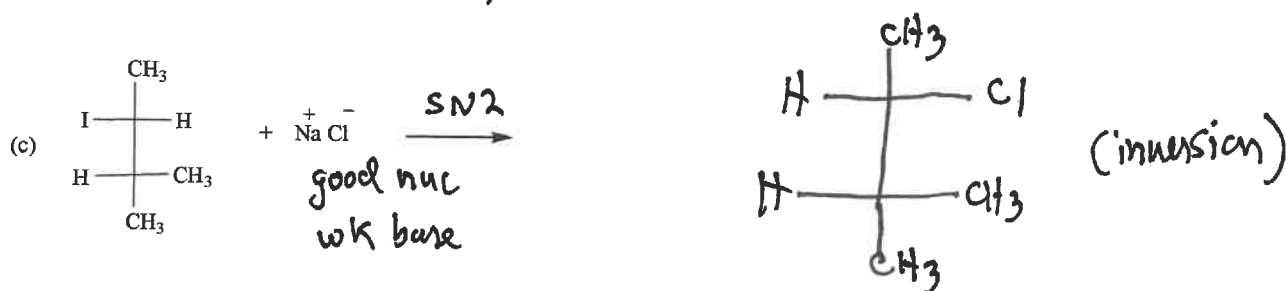
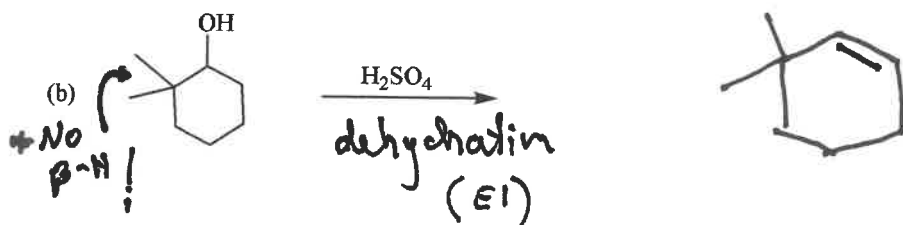
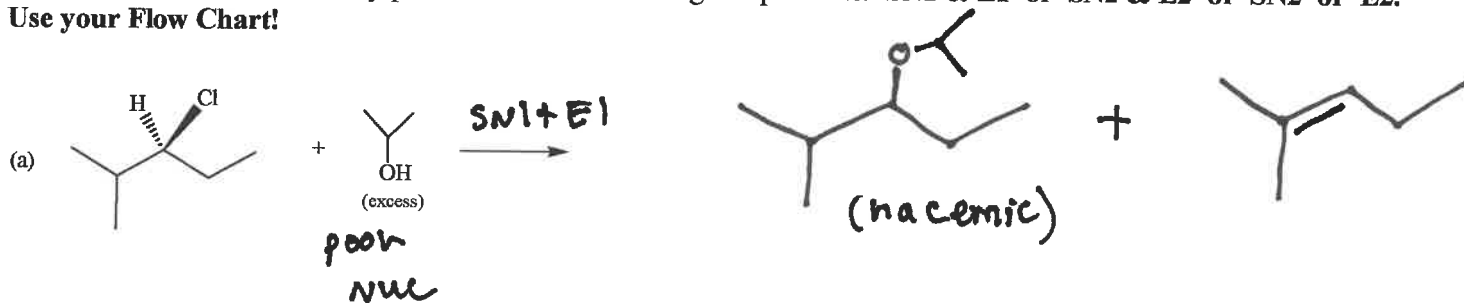


(b) **CIRCLE** the Lg and the β -H or β -D that will lead to E2 elimination.

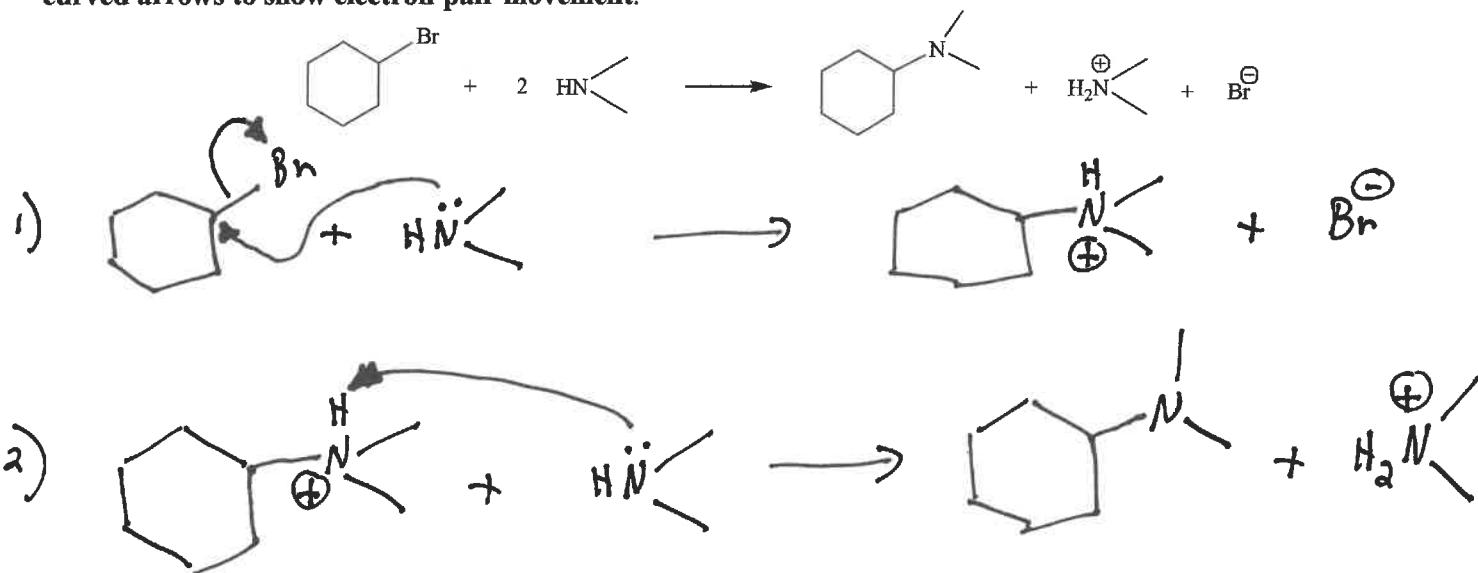
(c) Based on your answers in parts (a) & (b), use the 2D template at the right to draw the major E2 elimination product:



(7) Reactions. Complete the reactions shown below by drawing the structure of the **major, neutral organic products**. Draw the proper stereochemistry, if relevant. It is **NOT** necessary to balance these reactions or write the mechanisms. Remember, these reactions may produce ONE or TWO organic products: SN1 & E1 or SN2 & E2 or SN2 or E2 . Use your **Flow Chart!**



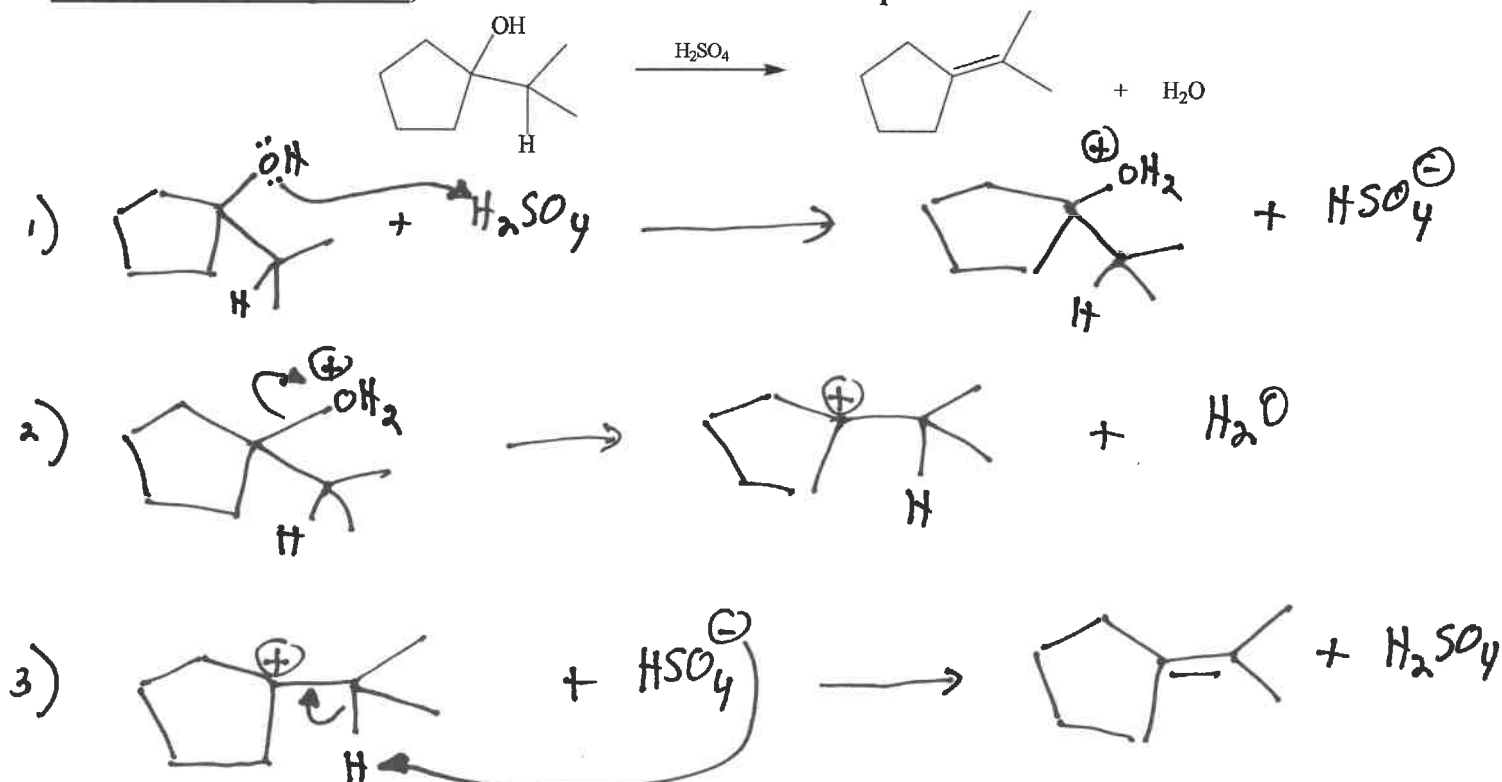
(8) **SN2 Mechanism (2 steps).** Write a complete mechanism that explains the formation of all products in the balanced net reaction shown below. **Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement.**



(9) Explain what is happening in Step #1 of the mechanism you drew in problem (8).

step #1 is an SN2 step where the Nuc substitutes for the Lg, producing a substitution intermediate + Lg.

(10) **E1 Alcohol Dehydration Mechanism (3 steps).** Write a complete mechanism that explains the formation of all products in the balanced net E1 reaction shown below. **Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement.**



(11) Explain what is happening in Step #2 of the mechanism you drew in problem (10).

The Lg (H₂O) leaves forming a carbocation intermediate.