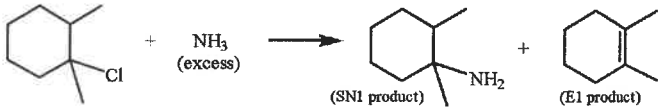
Names of all students (please print) Answer Key

CHEM 243 Organic Chemistry I **Points** _____ **(10 max)**

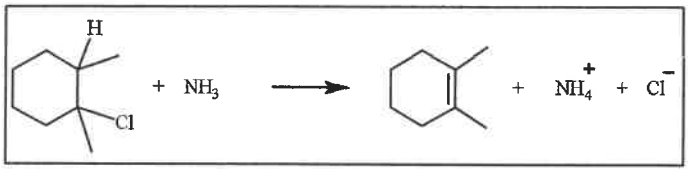
Worksheet #20: November 3, 2021. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade.

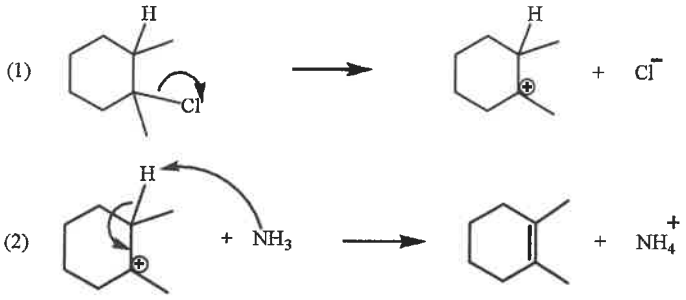
(1) Completion of work from Monday's worksheet: SN1/E1 Theory. We are trying to understand why we get **BOTH** SN1 and E1 products in the unbalanced reaction drawn at the right:



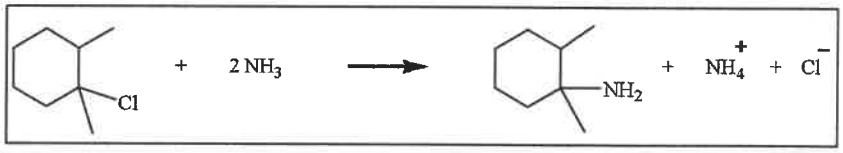
Lets first write the mechanisms for the E1 and SN1 reactions.

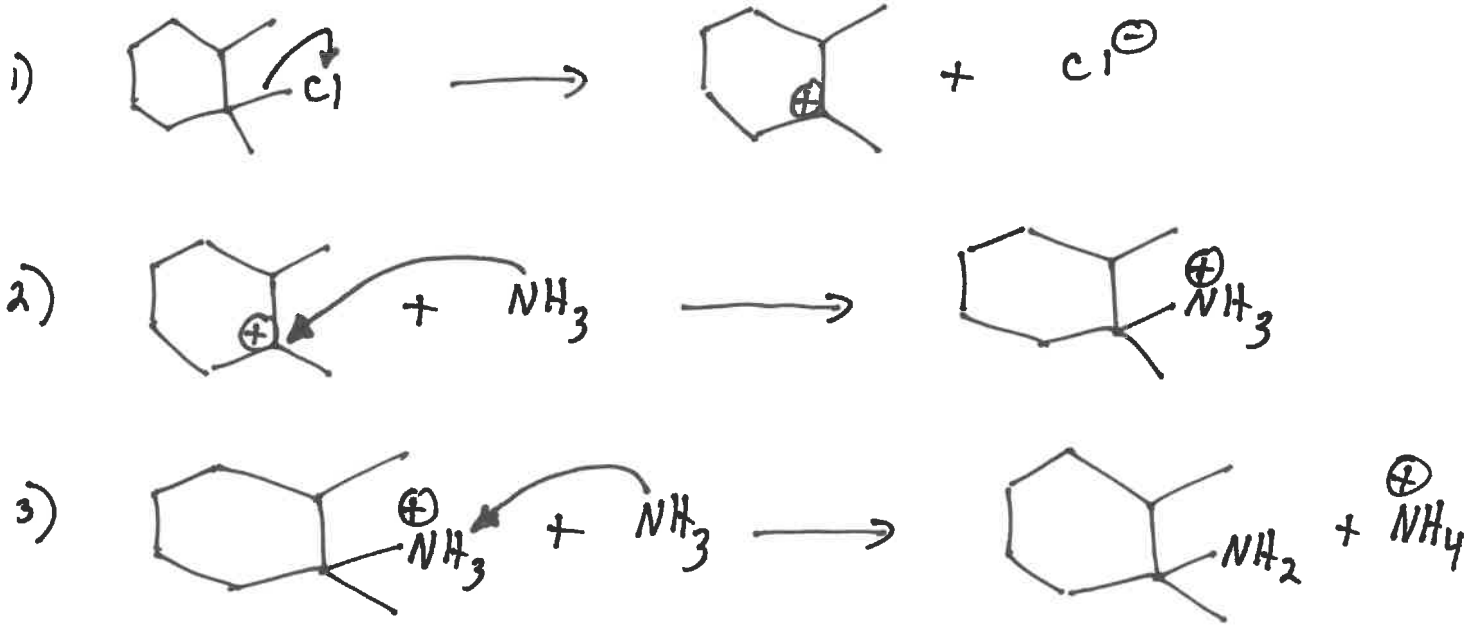
(a) E1 Mechanism (2 steps). The balanced E1 reaction is drawn in the box at the right. Here is the complete, 2-step mechanism from our last class:





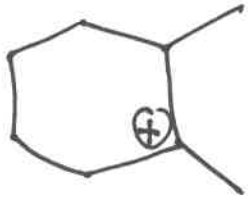
(b) SN1 Mechanism (3 steps). Now lets write a complete mechanism for the balanced SN1 net reaction shown in the box at the right. Your mechanism must consist of a series of balanced chemical equations, and curved arrows to show electron pair movement.





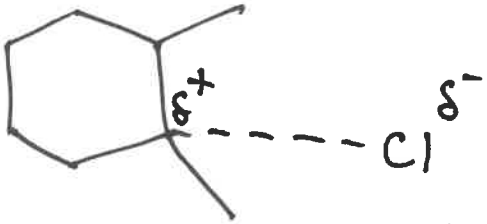
(c) The reason we get both SN1 and E1 products from the same reactants is that BOTH the E1 and SN1 reactions hace a common intermediate, and the same Rate Limiting Step! In the boxes below, (i) draw the structure of the **common intermediate** between both mechanisms, and (ii) the structure for the common **transition state** of the Rate-Limiting Step from each mechanism:

(i) Structure of the common **intermediate** between both mechanisms:



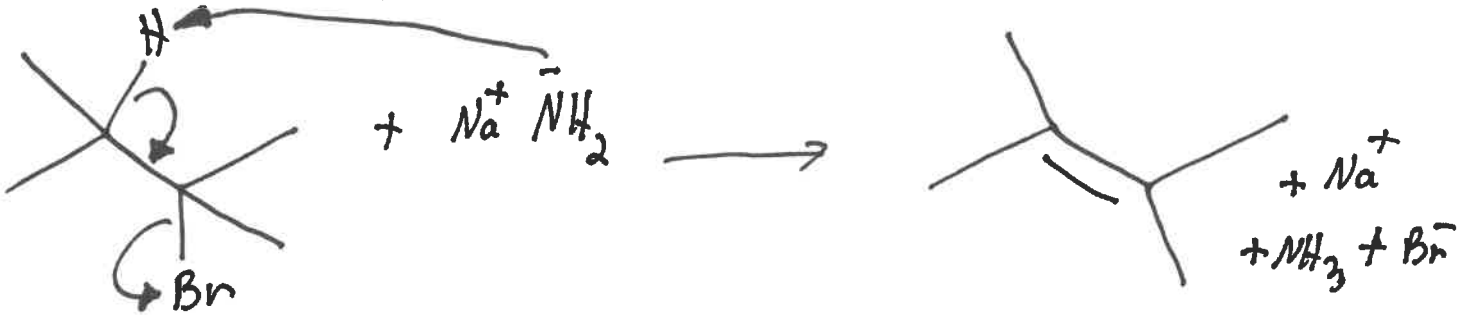
carbocation

(ii) Structure for the common **transition state** of the Rate-Limiting Step from each mechanism:

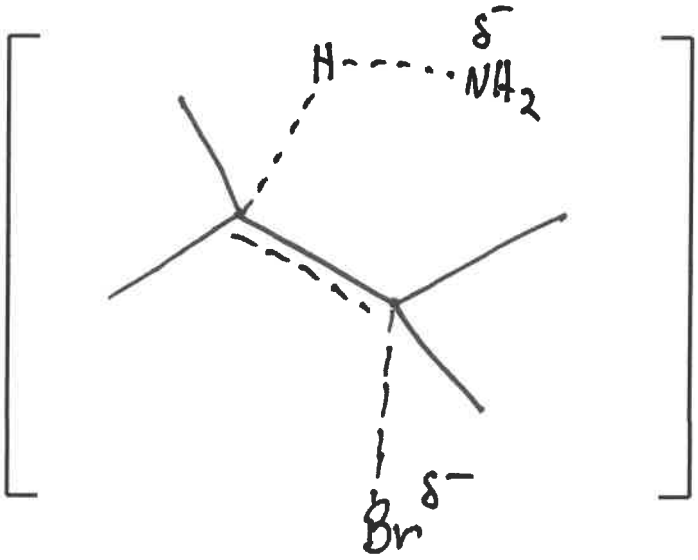


RLS: Lg leaves (For both mechanisms

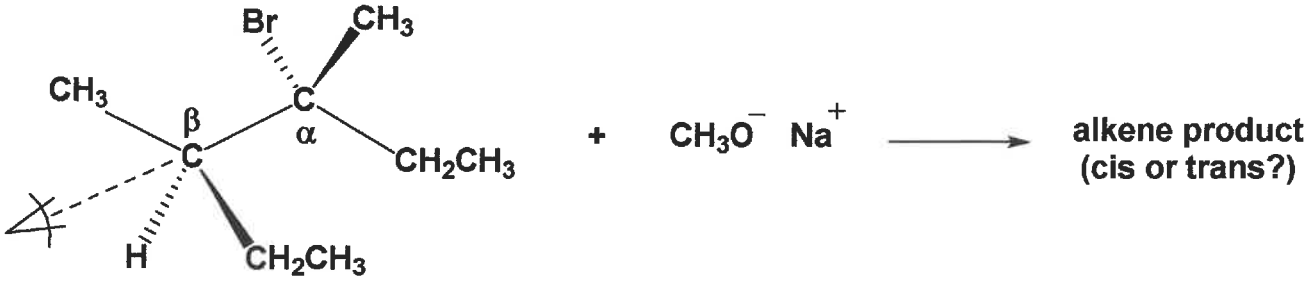
(2) The E2 Reaction Part I: Mechanism (1 step). Write a complete mechanism that explains the formation of all products in the balanced net reaction shown below. Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement.

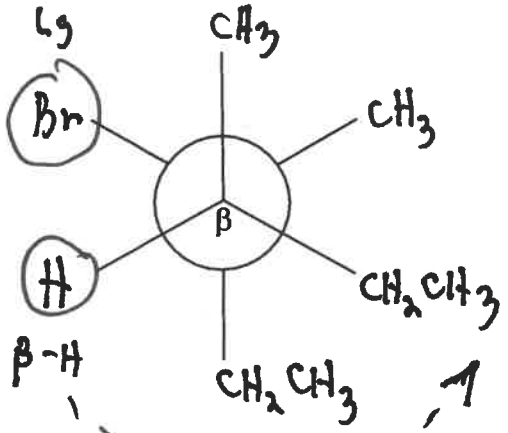
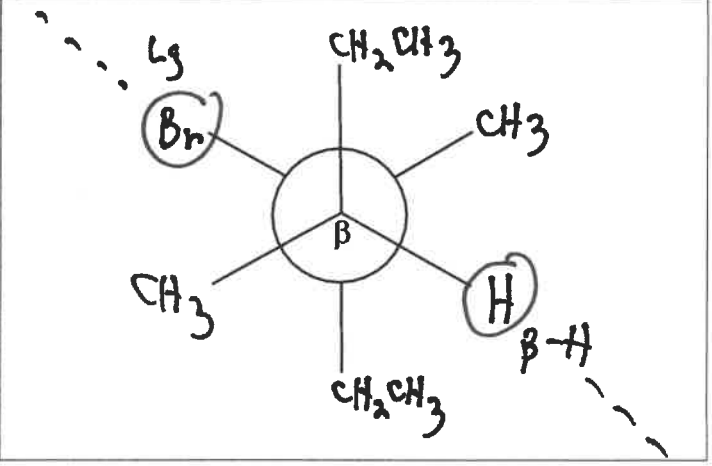


(3) The E2 Reaction Part II: Transition State. In the brackets at the right, draw the structure for the transition state of the Rate-Limiting Step from your mechanism above:

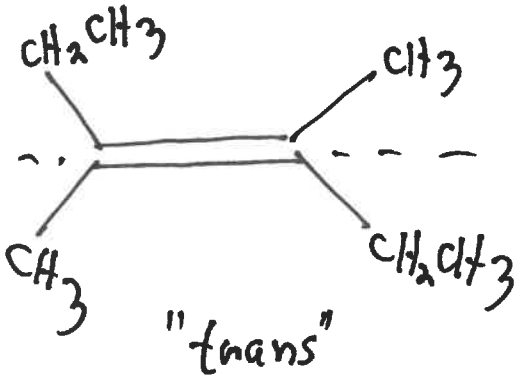


(4) The E2 Reaction Part III: Stereochemistry. The reaction drawn below proceeds by an E2 elimination reaction. You need to use a Newman Projection to help determine the structure of the alkene product, and the geometry of the double bond (cis or trans).



(a) **Newman Projection.** Looking directly at the β-carbon, draw a Newman Projection looking back toward the α-carbon:	(b) If necessary, rotate such that the β-hydrogen and leaving group are "anti".
	

(c) Based on your Newman Projection, draw the major **E2 product** expected from this reaction:



(d) Give an accurate IUPAC name for the structure you drew above (don't forget to assign the proper alkene geometry using the cis/trans prefix):

trans – 3,4-dimethyl – 3 – hexene