Names of all students (please print) _____

_____

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

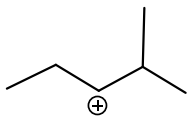
Worksheet #24: November 17, 2021. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade. **All the problems on this worksheet are Review Questions for Exam III.**

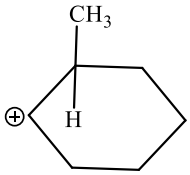
NOTE: The problems on Worksheets 24-28, and on the Study Guide for Exam IV, will be representative of the problems that might appear on the optional make-up exam.

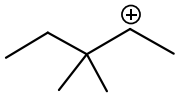
START HERE → Keys to Carbocation Rearrangement Reactions:

- 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°CH_3** (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°CH_3** shifts, the original 2° carbocation is extinguished, and a new 3° carbocation forms.

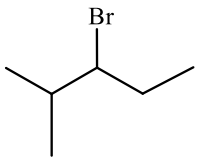
(1) Carbocation Rearrangement. Each of the following 2° carbocations will undergo rearrangement When an adjacent **3°H** or **3°CH_3** shifts to form a new 3° carbocation. Draw the structure of the new 3° carbocation.

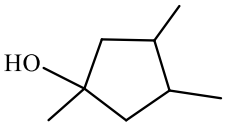
(a) 

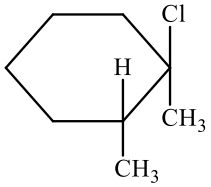
(b) 

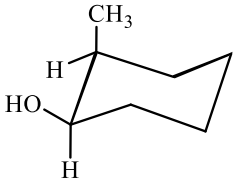
(c) 

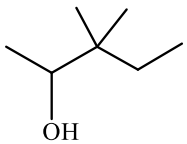
(2) Carbocation Rearrangement. Which of the following molecules have the potential to undergo ***rearrangement*** upon SN1 substitution or E1 elimination? Circle your choices.



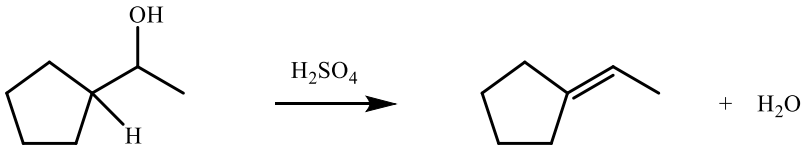








(3) Mechanism of an E1 Dehydration with Rearrangement (4 steps).



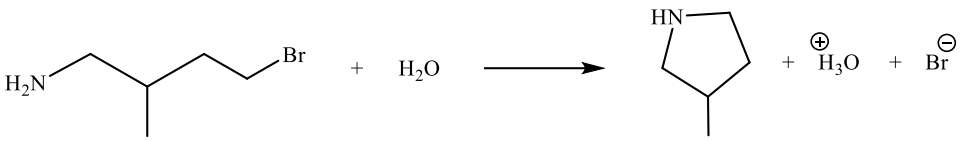
(a) Write a complete mechanism that explains the formation of all products in the balanced Net Equation for the reaction shown above. Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement.

(b) What is the role of the H_2SO_4 in your mechanism, and why is it needed? Be specific.

(c) EXPLAIN what is happening in Step #3 of your mechanism. Be specific!

Continued……

(4) <u>Intramolecular</u> SN2 Mechanism (2 steps). In Intramolecular reactions, one reactant molecule contains BOTH the nucleophile AND leaving group. A RING is always formed in these reactions.



In the space below, write a complete mechanism that explains the formation of all products in the balanced net reaction shown above. Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement. **HINT: The Leaving Group and Nucleophile are in the SAME molecule - Find them first!**