Names of all students (please print) _____

_____

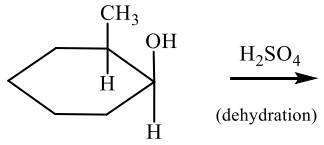
CHEM 243 Organic Chemistry I **Points _____ (10 max)**

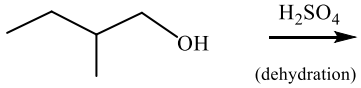
Worksheet #21: November 5, 2021. Complete the following worksheet by collaborating with a group of 3-4 students. You can use a text book or your lecture video notes. You must work together, with the names of all students included on **ONE** sheet and turned in for a group grade.

(1) Project Work! Your group should spend 10-15 minutes at the beginning **OR** end of today's class on project work.

- It would be most helpful if everyone in your group has a computer. If you need a laptop, please ask for one!
- Go your our CHEM 243 Teams site (link is in Blackboard).
- Find and open your group's project notebook.
- Find and open your group's power point template.
- Take a brief look at the power point template and note the headings on the various slides.
- Starting with Objective #1 (UN SDGs), begin moving some of that UN SDG info from your geroup notebook into the power point slide. You group will need to decide how much info to move over. If needed, you can create another slide for Objective #1.
- If time allows, do the same for Objective #2 (green chemistry)
- No more than 10-15 minutes!

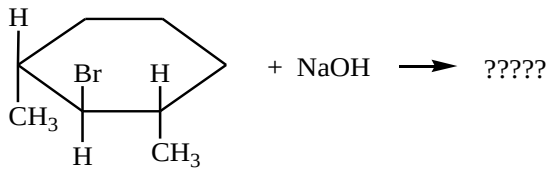
(2) Dehydration Reactions (alkene products). Complete the following reactions by drawing the structure of the major neutral organic products, including proper stereochemistry.

(a) 

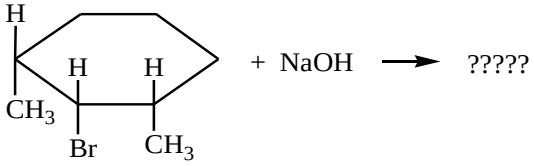
(b) 

(3) E2 eliminations in cyclohexane rings. In the previous worksheet we saw that for E2 elimination reactions to produce alkene product, the **β-H must be anti to the leaving group**. It was easy to make the β-H anti to the leaving group in a Newman Projection.

The same geometry is also required in cycloalkane rings, where both the β-H and Lg must be anti. This is easy to see as they will be **trans to each other, or both axial.** In the example below, when Compounds (A) and (B) were mixed with a strong base, only one of these compounds reacted to form any E2 alkene product. How do you explain this observation?

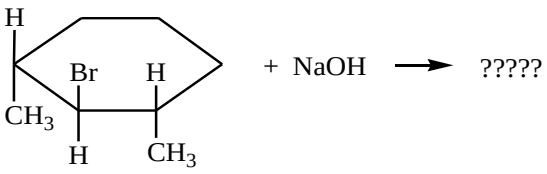


Compound (A)

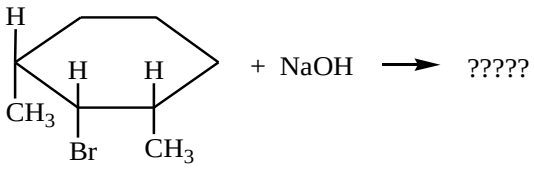


Compound (B)

Continued……



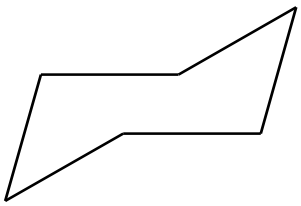
Compound (A)



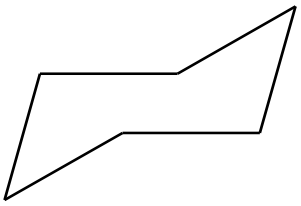
Compound (B)

(**a) Inspection of the 2D structures.** Based on the paragraph above, by just looking at A and B, **CIRCLE** the compound you believe will react to form E2 alkene product (β-H and Lg must be anti = trans).

(b) Inspection of the 3D chair structures. On the templates below, draw the **most stable chair conformers** for (A) and (B).



Compound (A)



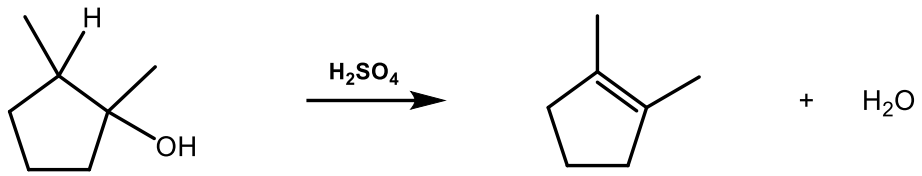
Compound (B)

(c) Based on the conformations you drew above, will compound (A) or (B) form the E2 elimination product? REMEMBER, the Lg and β-H BOTH must be axial (anti)! Draw the **2D structure** of the E2 product:

(d) Give an IUPAC name for the E2 product you drew above.

Continued……

(4) Mechanism of E1 Dehydration (3 steps). Based on video 7-4, write a complete mechanism that explains the formation of all products in the balanced Net Equation for the reaction shown below. Your mechanism must consist of a series of individual, balanced chemical equations, and curved arrows to show electron pair movement.



NOTES:
(1) Water is the leaving group through acid catalysis.
(2) The first step is an acid/base reaction where the acid catalyst protonates the alcohol, turning it into a good leaving group (H_2O), and the acid catalyst is converted to its conjugate base (HSO_4^-).
(3) The remaining steps are normal E1 mechanism.
(4) The last step (Step #3) is also an acid/base step where the conjugate base from Step #1 removes the b-H, forming the alkene product and regenerating the catalyst.