CHEM221 Section 01 Dr. C. Rogers **NAME:**

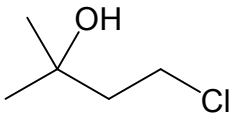
INTRODUCTORY ORGANIC CHEMISTRY I --- **PROBLEM SET #2**

INSTRUCTIONS: HAND IN STAPLED, COMPLETED ASSIGNMENT (no extra pages please) **AT THE BEGINNING OF CLASS on Tues.Oct.25.** LATE SUBMISSIONS WILL **NOT** BE ACCEPTED (EARLY IS OK). ANSWER ALL QUESTIONS, ALL MATERIAL WILL BE COVERED BEFORE THE DUE DATE.

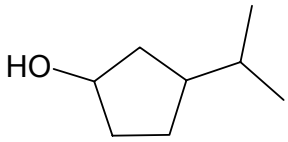
NOTE: In some questions, I have asked you to draw relevant structures/interactions/etc. to support your explanations. This should be standard practice any time you are asked to EXPLAIN anything. Next time, and on exams, I won't explicitly ask….

 # 1. Provide complete systematic (IUPAC) names for the following molecules:

i)



ii)



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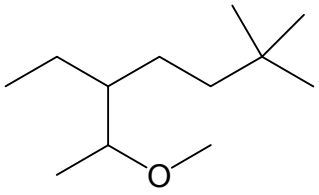
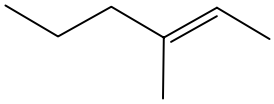


iv)



 # 2. Draw skeletal (line) structures of the following molecules:

i) 5-cyclobutyl-N-methylpentan-2-amine

ii) *trans*-1-ethyl-3-fluorocyclohexane

iii) methyldipropylammonium iodide

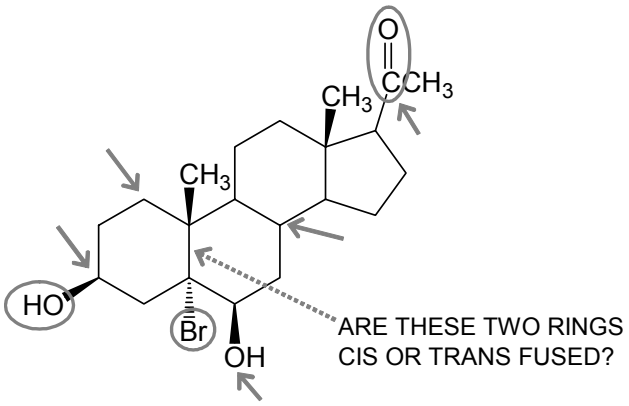
iv) 6-bromo-4-ethoxy-2-heptanol

 # 3. Rank the following compounds in order of increasing boiling points. Explain your reasoning; you must include structural drawings and detailed descriptions of relevant interactions to receive full marks. *(You can look up the actual boiling points, but you will not get marks unless your explanation is complete.)*

2,3-dimethylbutane, n-hexane, 2-methylbutan-2-ol, neopentane, pentanol

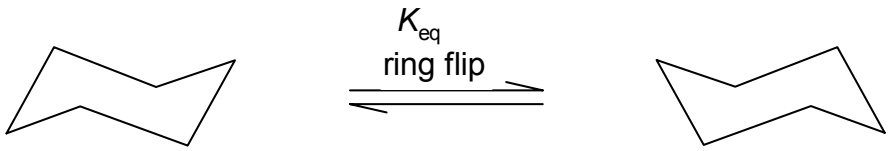
LOWEST BP < < < < HIGHEST BP

 # 4. For the following molecule: name the circled functional groups, give the hybridization of the atoms (not Hs) indicated by the arrows, and answer the question about the bottom two fused rings.



 # 5.a) Draw the necessary substituents on the rings to complete the "ring-flipping" equilibrium for ***cis*-2-chlorocyclohexan-1-ol**. On each conformer, label the substituents as "axial" or "equatorial".

less stable conformer more stable conformer



b) The incomplete Newman projections below show the chair conformers from part (a), as viewed down their C1-C2 bonds (C1 at front left) and C5-C4 bonds (C5 at front right). For each chair from part (a), complete the Newman projection by adding the substituents and ring hydrogens. Then, explain the difference in the two conformers' stabilities by comparing their levels of torsional strain (eclipsed *vs.* staggered bonds) and steric strain (gauche interactions, and 1,3- and/or 1,4-diaxial interactions).

less stable conformer more stable conformer

 # 6. a) Draw line structures of all acyclic (*i.e.,* no rings) constitutional isomers with the formula C_4H_8O. *[Hint: so far, I've found 13 isomers].* Organize your drawings such that pairs of molecules that are geometric isomers are side-by-side (please circle the pairs). Give complete systematic names for all compounds, including E/Z descriptors for alkenes if appropriate.

b) Several of the isomers in part (a) contain a hydroxyl group. In how many of these isomers is the hydroxyl group in a vinylic position? How does the acidity of a vinyl alcohol compare to an alkyl alcohol? Why?