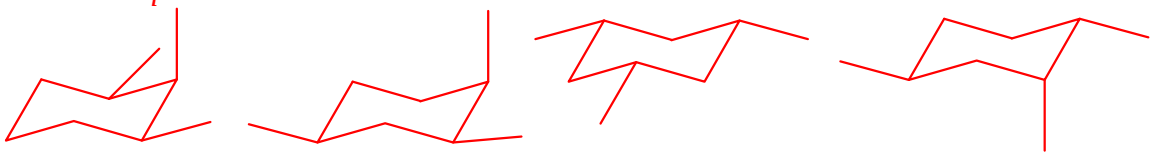
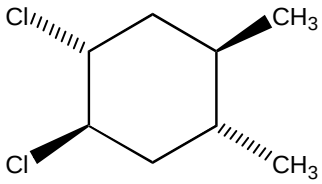
1. Find the most stable conformation for the following
   a. 1,2,3 trimethylcyclohexane, all methyl groups cis
   b. 1,2,4 trimethylcyclohexane, all methyl groups cis
   c. 1,3,5-trimethylcyclohexane , all methyl groups cis
   d. 1,2,4 trimethylcyclohexane, in which the 1- and 4- methyl groups are trans and the 1- and 2- methyl groups are cis . What is the relationship between the 2- and 4- methyl groups?

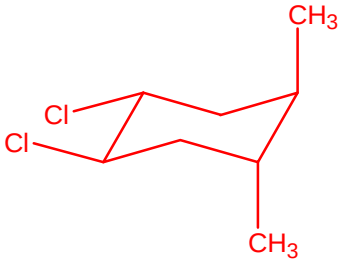
*The general answer is that we try to get at least 2 methyl groups into an equatorial position. Of course, there are many other ways how to draw this ( by rotating the molecule as whole around a horizontal or vertical axis); just make sure to clearly show axial and equatorial bonds.*



a. b. c. d., trans

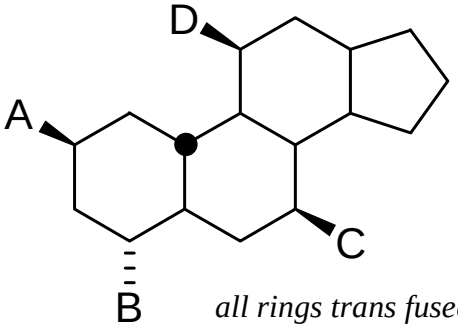
2. Show the conformation for the following in which at least one of the methyl groups is axial. Is this the most stable conformation ? Explain.



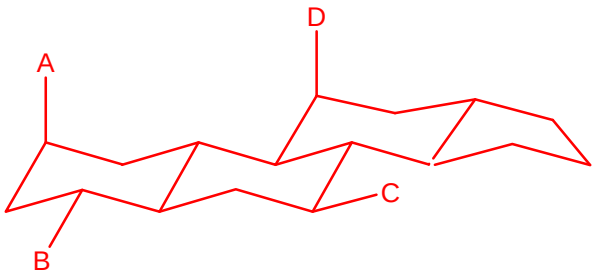




*This is the less stable conformation; the methyl groups being the more "demanding" substituents should be in the equatorial position. This can be achieved by "ring flip"*

3. Consider the following steroidal compound substituted with A, B, C and D. Indicate whether these substituents occupy axial or equatorial positions .

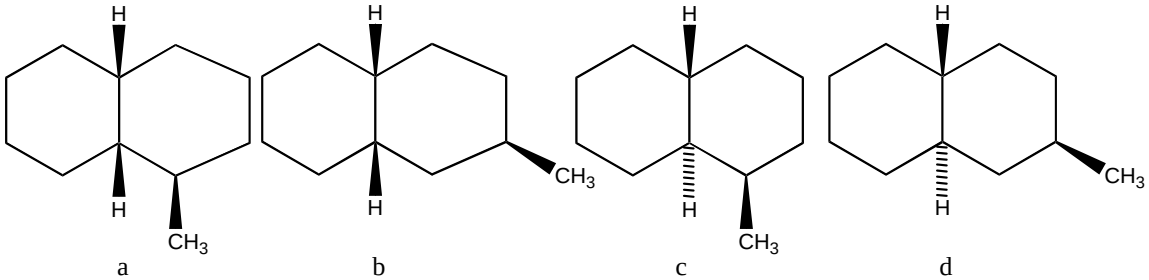


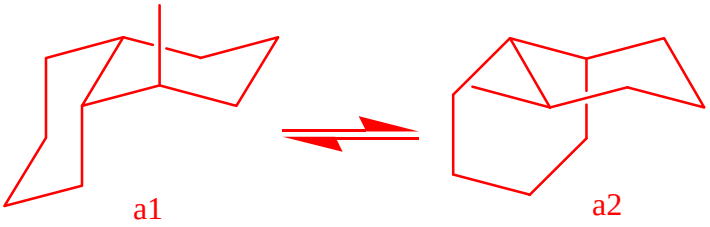

*all rings trans fused*

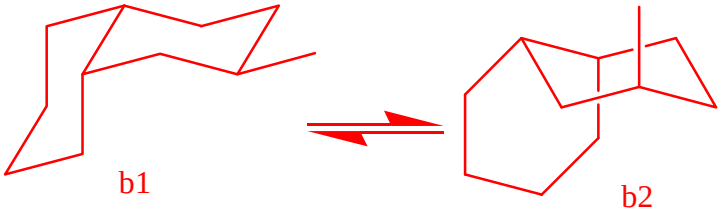


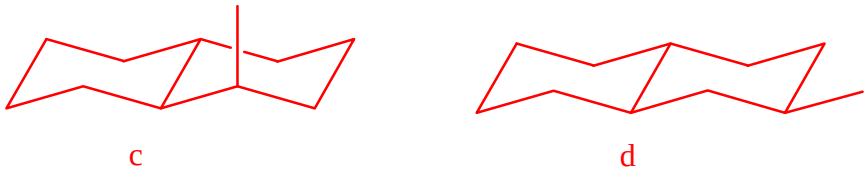

A. *axial*, B. *equatorial*, C. *equatorial*, D. *axial*

4. Show all possible conformations for the following substituted decalins and, if there are several, point out the more stable one in each case.
Can you think of any other methyl decalins. If so show them. Ignore those where the methyl group is at a "joint" Carbon. (Also, ignore any optical isomers; just in case you know about those)




*a2 is more stable than a1 because the methyl group is equatorial;*
*b1 is more stable than b2 because the methyl group is equatorial;*
*c and d are trans decalins which are rigid and cannot " ringflip";*
*Yes, there are many others, as shown below. All trans decalins are rigid and the cis decalins mobile. (There might be more?)*
*In all cis decalins the methyl group will be equatorial;*
*while in the trans decalins it depends, due to the rigidity.*