**Problem of the Week #9**

The molecule below is menthol, with the stereochemistry omitted. (a) Identify all stereocenters in menthol. (b) How many stereocenters exist for the menthol structure? (c) Draw all stereoisomers of menthol and identify all pairs of enantiomers.



Natural (-)-menthol, the volatile oil primarily responsible for the flavor and aroma of peppermint, is the *1R, 2S, 5R*-stereoisomer. (d) Identify (-)-menthol from the structures you drew in part (c). (e) Another of the naturally occurring diastereomers of menthol is (+)-isomenthol, the *1*S, *2R, 5R-*stereoisomer. Identify (+)-isomenthol among your structures. (f) A third is (+)-neomenthol, the *1S, 2S, 5R*-compound. Find (+)-neomenthol among your structures. (g) Based on your understanding of the conformations of substituted cyclohexanes, what is the stability order (from most stable to least stable) for the three diasteromers, menthol, isomenthol, and neomenthol?

1. Ring carbons 1, 2, and 5 are stereocenters.
2. 3 stereocenters, 8 possible stereoisomers











1. Only menthol possesses a chair conformation in which all three substituents are equatorial. It will be the most stable isomer. Neomenthol has a structure in which both alkyl groups are equatorial and only the relatively small hydroxyl group is axial. Isomenthol must have one alkyl group in the axial position.

Menthol > neomenthol > isomenthol