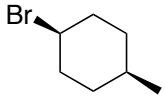
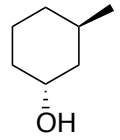
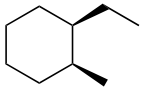
CHM 1321
Problem set 4

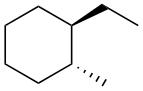
1) Draw all the conformations of butane in a Newman projection looking down the C2-C3 bond. Draw an energy diagram with all of these conformations.

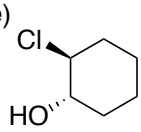
2) Draw the following line structures in 3D (chairs). For parts g and h, also draw in the lone pairs on the oxygen in the appropriate orbital.

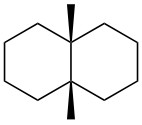
a) 

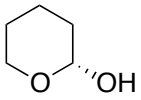
b) 

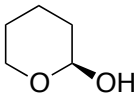
c) 

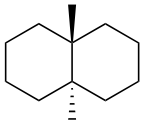
d) 

e) 

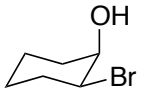
f) 

g) 

h) 

i) 

3) First, draw the other chair conformation (i.e., flip the chair). Then, draw the chairs as line structures.

a) 

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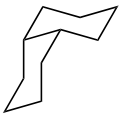
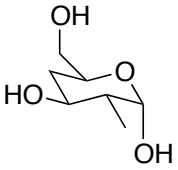
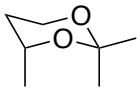
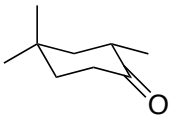
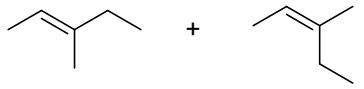
c) 

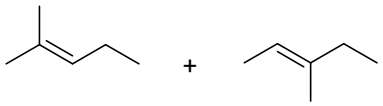
d) 

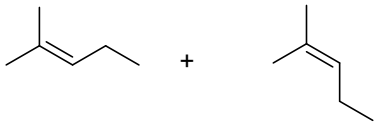
e) 

f) 

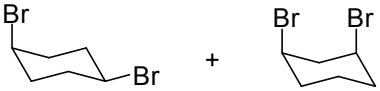
4) Identify each of the following pairs as constitutional isomers, stereoisomers (configurational isomers), or conformers.

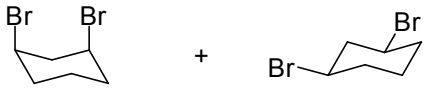
a) 

b) 

c) 

d) 

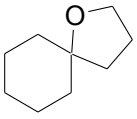
e) 

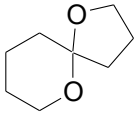
f) 

5) Draw each structure below along with its mirror image. Indicate whether the compound is chiral or achiral.

a) *cis*-1,2-dimethylcyclopentane. b) *trans*-1,2-dimethylcyclopentane

c) *cis*-1,3-dimethylcyclohexane d) *trans*-1,3-dimethylcyclohexane

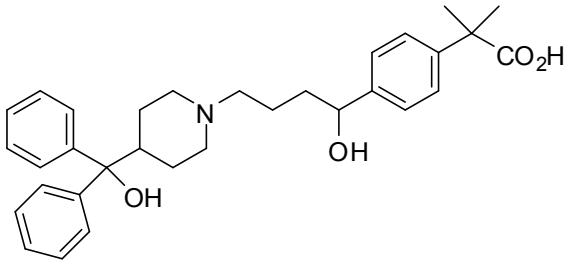
e) 

f) 

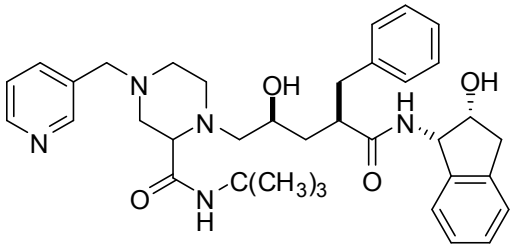
g) $CH_3CClBrH$ h) $(CH_3)_2CHOH$ i) $CH_3CH_2CHOHCH_3$ j) $CH_3CH_2CHOHCH_2CH_3$

6) Identify the stereogenic centres in the following molecules:

a. fexofenadine (Allegra):



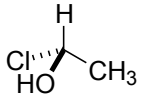
b. Indinavir (Crixivan):

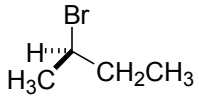


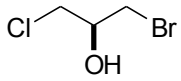
7) Draw each of the following compounds in three dimensions. Draw the mirror image of each and determine whether the compounds are chiral. For all chiral compounds, determine whether the configuration of each stereogenic centre is R or S.

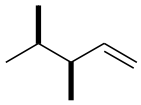
a) 1,3-dibromobutane b) 2-butanol c) 2-methylpentane d) 3-methylpentane
e) 3-methylhexane f) 1,2-dihydroxypropane g) 1, 2, 4-trihydroxybutane

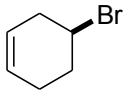
8) For the following compounds, show the stereogenic center(s) by labeling them with a star (*) and determine the configuration of each centre (R or S).

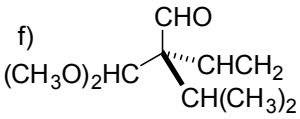
a) 

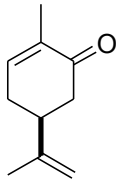
b) 

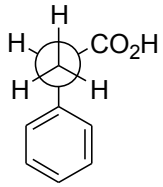
c) 

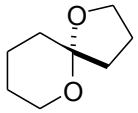
d) 

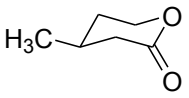
e) 

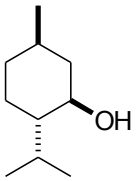
f) 

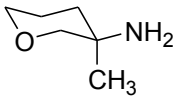
g) 

h) 

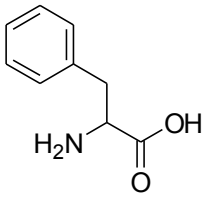
i) 

j) 

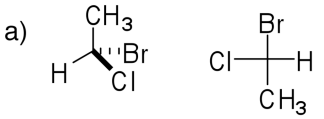
k) 

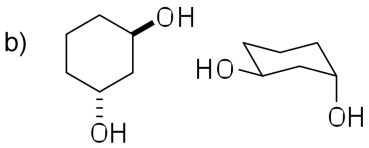
l) 

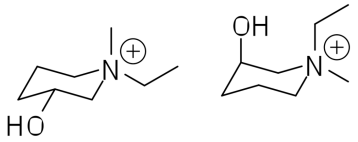
9) Phenylalanine has the following structure, given that the configuration is S, what is the proper way to draw the compound?

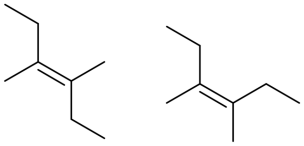


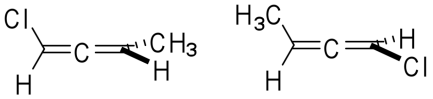
10) Give the stereochemical relationship between each pair of isomers (enantiomers, diastereomers, meso compounds).

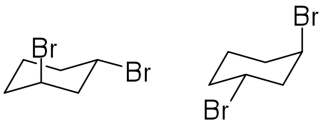
a) 

b) 

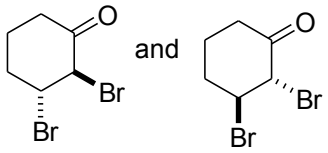
c) 

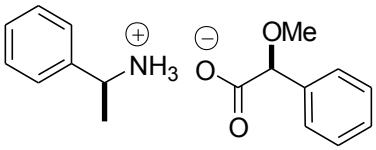
d) 

e) 

f) 

11) Which of the following pairs of compounds could be separated by a method such as distillation or recrystallization?


and


and