Organic Chemistry I,CHM 3140
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Exam II Review – Practice Problems

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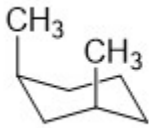
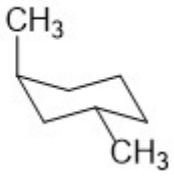
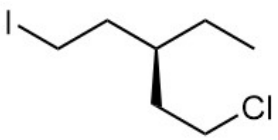
1 Which isomer is more thermodynamically stable (*i.e.* has a lower heat of combustion), *cis* or *trans* 1,3-dimethylcyclohexane? Explain.



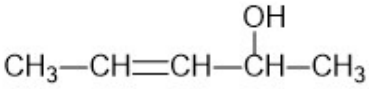


2 Predict the direction of the equilibrium (forward, reverse or neither).
Hint: consider Newman projections.

3 Which is the correct IUPAC name for the given compound?



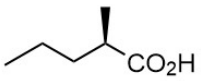
4 Draw all stereoisomers of the given compound. How many stereoisomers are there, in total?



A) 1
B) 2
C) 3
D) 4

Which of the following statements is NOT true about a given sample of (R)-acid that has a specific rotation [α] = −45 and 90% ee?

5



(R)-acid

90% ee sample of (R)-acid has [α] = −45

A) The sample is optically active.

B) Pure (R)-acid would have [α] = −50.

C) The sample contains 90% (R) enantiomer and 10% racemic mixture.

D) The sample contains 95% (R) enantiomer and 5% (S) enantiomer.

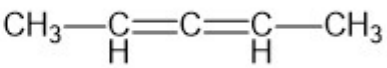
E) The (S)-acid enantiomer is levorotatory.

6 Determine whether or not each compound below is optically active. Explain.

trans-1,3-diisopropylcyclobutane

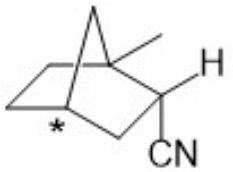
trans-1,2-diisopropylcyclobutane

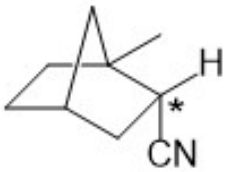
7 Determine whether or not each compound below has an enantiomer. Explain.

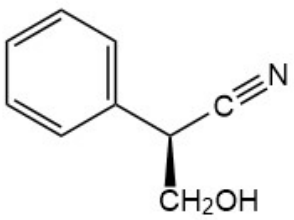


What is the configuration of the marked (*) carbon?

8







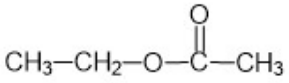
A) R

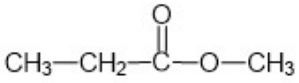
B) S

C) neither

Which would be better to distinguish the following compounds, ^{1}H or ^{13}C NMR (or are they equally suitable)? Explain, and describe the difference(s) to look for.

9

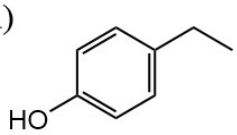




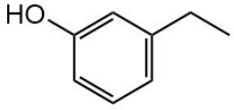
10 Which compound gives the following ^{1}H NMR spectrum?

(Klein text problem 15.75)

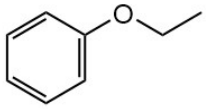
A)



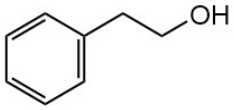
B)



C)

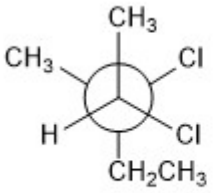


D)

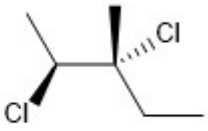


11 What is the relationship of the following pairs of compounds?

A) constitutional isomers
B) enantiomers
C) diastereomers
D) the same compound
E) unrelated



1

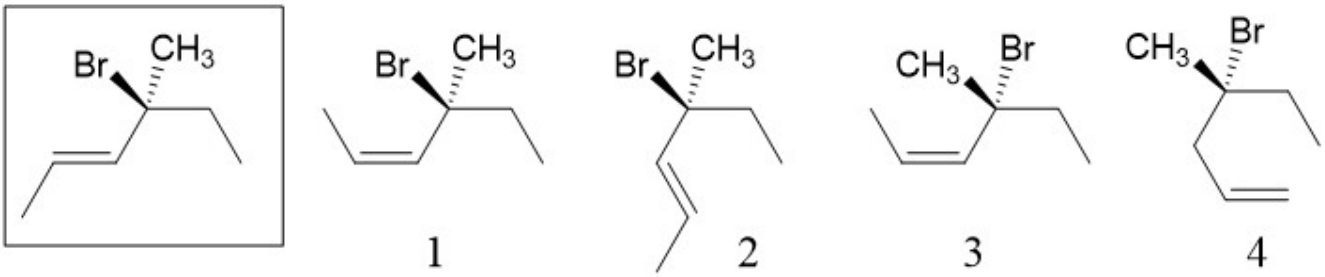


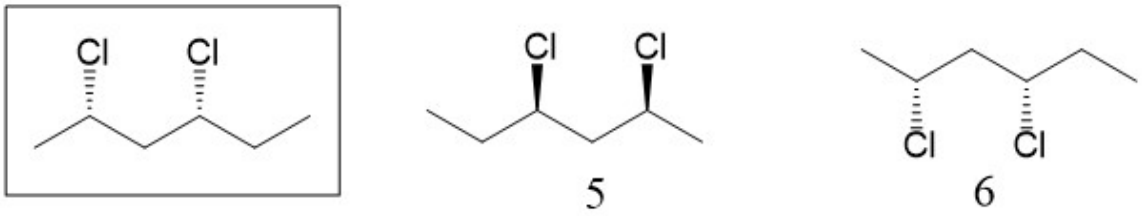
2

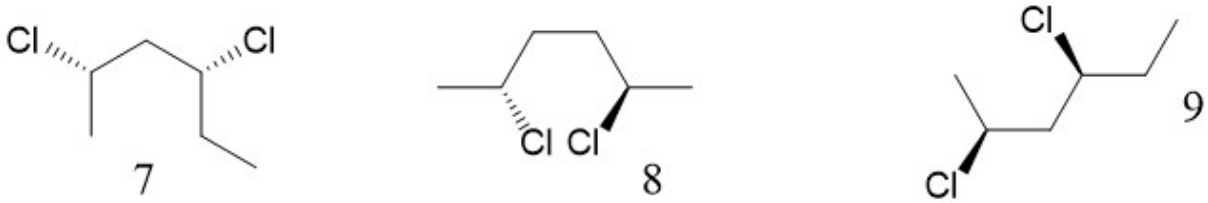
What is the IUPAC name of compound **1**?
Be sure to include stereochemistry.

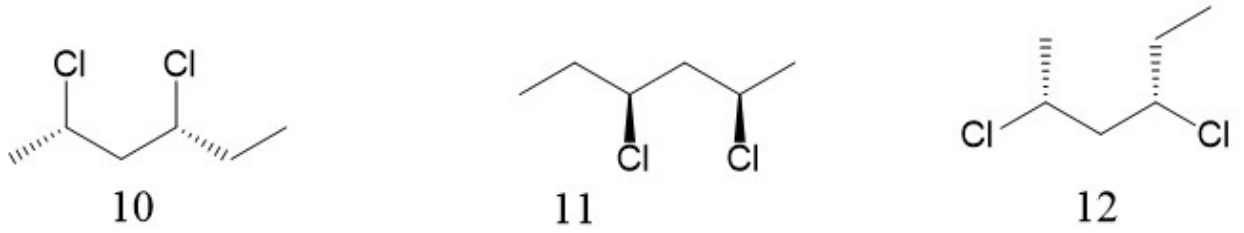
12 What is the relationship of the following pairs of compounds? (Compare the structure in each box to the other drawings.)

A) constitutional isomers
B) enantiomers
C) diastereomers
D) the same compound
E) unrelated







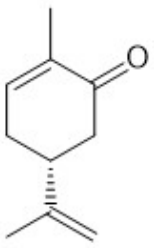


Group work: Draw the enantiomer of the given structure (*R* or *S* carvone?) using two methods.

13 (*R*)-carvone or (*S*)-carvone?

Draw mirror image:

Invert all chiral centers:



(*R*)-carvone smells/tastes like spearmint, and (*S*)-carvone like caraway seeds (used in rye bread). What does that tell you about the odor receptors in your nose and taste receptors in your mouth?