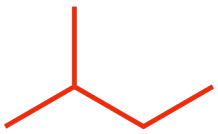
How to name your molecule

1) Identify longest carbon chain (the parent chain).
   * If multiple competing parent chains, then:
     (a) choose chain with more side chains
     (b) choose chain with substituents with lowest numbers
   * If a ring is present (cyclo-) it is usually the parent chain.
2) Identify all substituents off parent chain.
3) Number carbons of the parent chain from end that gives the substituents the lowest numbers.
   * If multiple of the same substituent, use prefixes: di-, tri-, tetra-, etc.
4) If more than one substituent, put them in alphabetical order by the root of the substituent (butyl, ethyl, methyl, etc.).

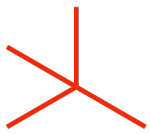
1. Determine and name the constitutional isomers for each alkane.

A) C_5H_{12}

pentane



2-methylbutane



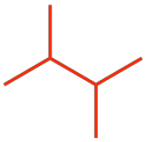
2,2-dimethylpropane

B) C_6H_{14}

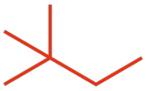
hexane

2-methylpentane

3-methylpentane



2,3-dimethylbutane



2,2-dimethylbutane

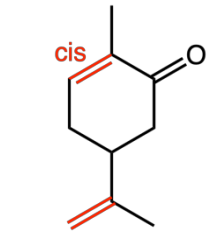
2. Carvone (shown to the right) is a natural product found in spearmint oil.

A) Label the alkenes as *cis* or *trans*, if applicable. see structure

B) Does carvone exhibit geometric isomerism?

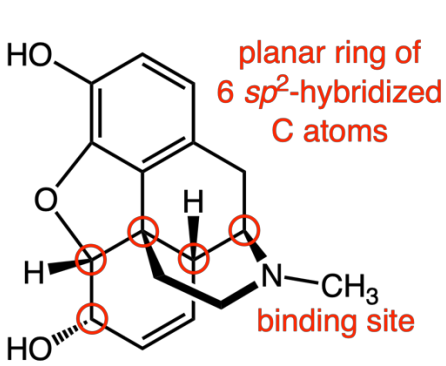
If so, draw the other geometric isomer. If not, why?

Carvone can only exist in this isomer because you cannot draw a *trans*- version of the double bond on the ring due to impossible ring strain.

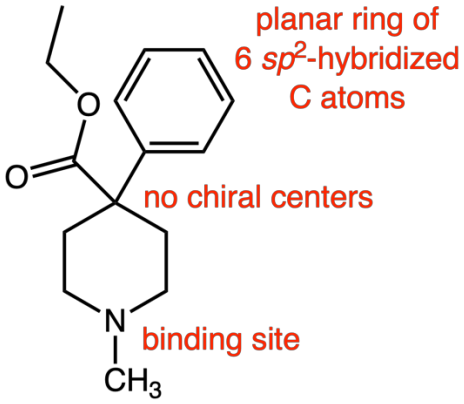


no cis/trans

3. Given below are two pain medications: morphine and Demerol.



Morphine



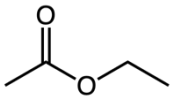
Demerol

A) Circle all the chiral centers in morphine.

B) Both morphine and Demerol interact with receptors similarly because they share similar structural features. In particular, one portion of both molecules is flat/planar and another portion of both molecules binds to the receptor site.

Identify the two portions of the molecules described above for both morphine and Demerol.

4. Starting with ethane as the <u>only</u> source of carbons, suggest a sequence of reactions likely to produce ethyl acetate ($CH_3CO_2CH_2CH_3$, shown to the right).



You should work backwards from ethyl acetate to identify that its formation results from an acid-catalyzed condensation reaction between acetic acid (red moiety, top structures and reactions) and ethanol (blue moiety, bottom structures and reactions). From there, you must consider how it is possible to synthesize both molecules—again, by working backwards. Acetic acid is a carboxylic acid, which can be formed by oxidation of an aldehyde, and the aldehyde formed by oxidation of a primary alcohol (ethanol). The oxidations require the use of an oxidant (or reducing agent), [OX]. Ethanol can be formed by a nucleophilic substitution reaction whereby a halide group (I chose -Cl) is substituted for a hydroxide ion ($^-$OH). Lastly, the alkylhalide (C_2H_5Cl) can be formed by radical halogenation of ethane.