

**CHEM 100: Exam #4****April 15, 2002**

Name (printed) \_\_\_\_\_

100 points. Read carefully! Write your answers **in the space provided**.**Part I: Multiple Choice.** (2 pts. each)

- Which could contain the conjugate base of acetic acid?  
a) acetone    b) sodium chloride    c) sodium ethanoate    d) sodium hydroxide    e) sodium metal
- A molecule containing which functional group would be the most soluble in water?  
a) alcohol    b) alkyne    c) sulfide    d) ether    e) ester
- A chiral carbon can be part of which functional group?  
a) alkane    b) alkene    c) alkyne    d) aromatic    e) nitro group
- Which functional group contains alcohols?  
a) anhydride    b) carboxylic acid    c) glycol    d) ketone    e) phenol
- Another name for alkenes is  
a) alkanes    b) mercaptans    c) olefins    d) saturated hydrocarbons    e) waxes

**Part II: True/False.** (2 pts. each) Circle T or F.

- T    F    the carbons of alkynes are  $sp^2$  hybridized
- T    F    aromatics are flat molecules
- T    F    amides can exhibit hydrogen bonding
- T    F    chloromethane is a polar molecule
- T    F    an -OH group attached to a cyclohexane is called a phenol

**Part III: Functional Groups/Nomenclature/Isomerism**

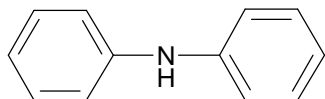
11. (28 pts.) Draw complete structures (structural, condensed, or "stick" formulas) for the following species, showing all relevant stereochemistry (that is, showing *cis* and *trans* clearly):

a. <i>trans</i> -1,3-dibromocyclopentane	b. ethyl isopropyl ether
c. <i>ortho</i> -chlorophenol	d. 4-chloro-3,3-dimethyl-1-octyne
e. <i>cis</i> -3 hexene	f. 2-ethylbutanal

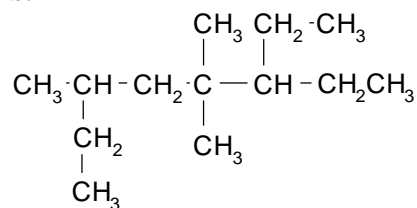
g. ethyl acetate (ethyl ethanoate)

12. (28 pts.) Name the following compounds by any acceptable method:

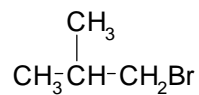
a.



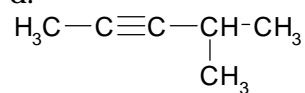
b.



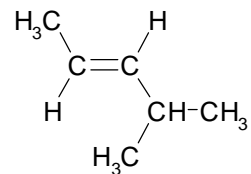
c.



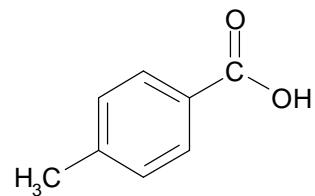
d.



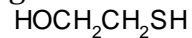
e.



f.



g.



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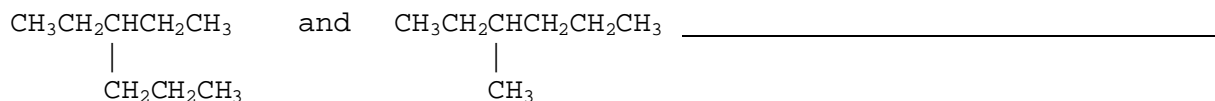
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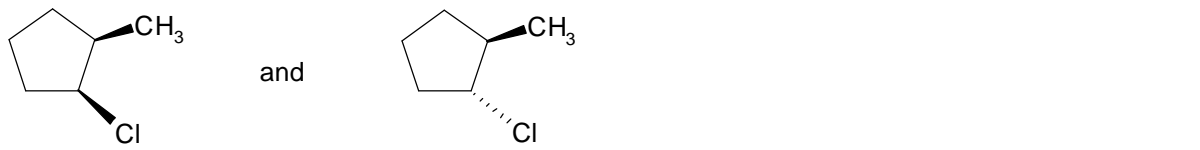
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13. (24 pts.) Indicate the isomeric relationship between each of the following pairs of compounds (identical, structural isomers, geometric (*cis/trans*) isomers, not isomers).

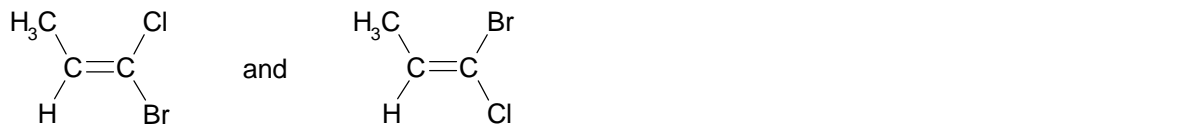
a.



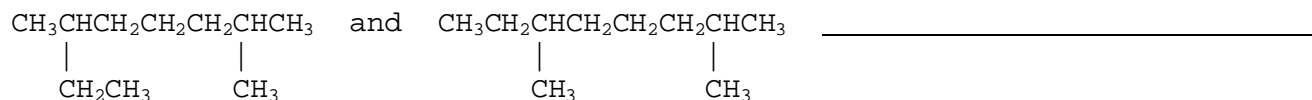
b.



c.



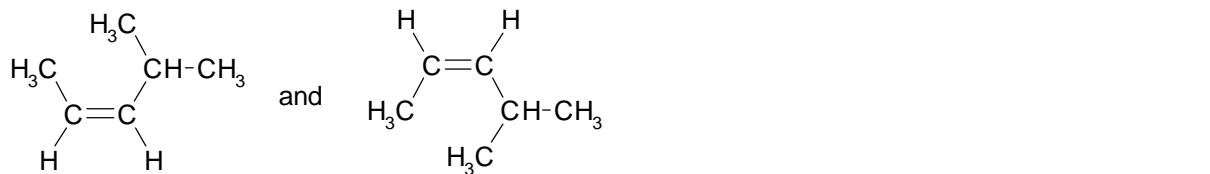
d.



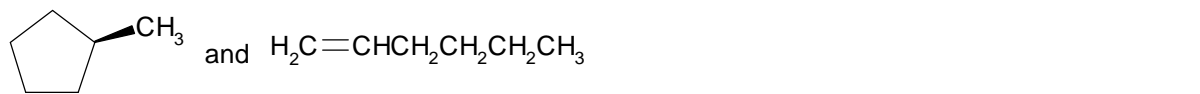
e.



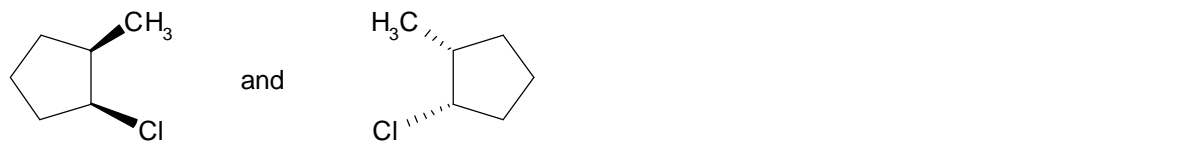
f.



g.



h.



14. (10 pt. bonus) Identify as many **different** functional groups as you can (other than “alkane”) in the following hypothetical molecule, as shown in the example below.

