Name: _____

CHM227sum141b

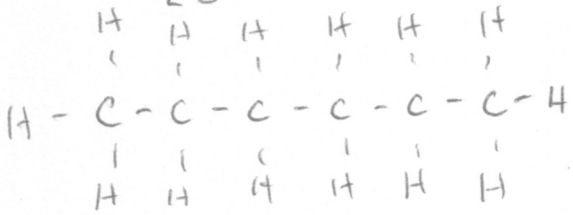
Short Answer

1. Draw Lewis structures and line/angle structures for 5 isomers of C_6H_{14}. Provide a name for each.

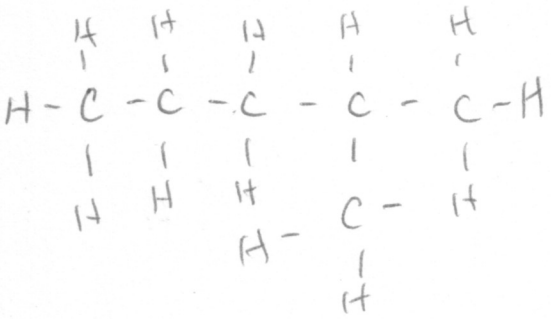
LINE/ANGLE

n-HEXANE

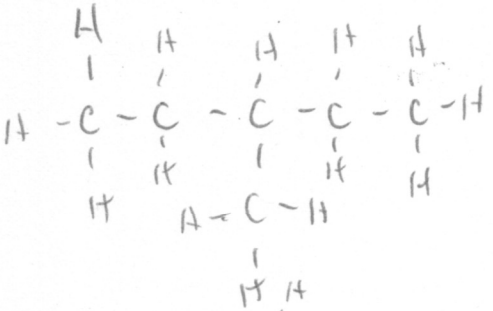
LEWIS



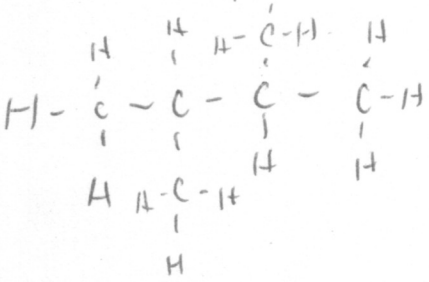
2-METHYL PENTANE



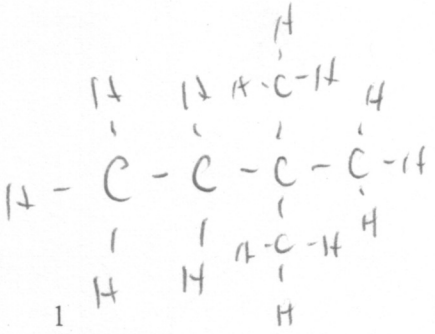
3-METHYLPENTANE



2,3-DIMETHYLBUTANE



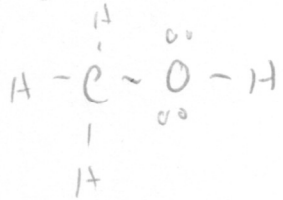
2,2,DIMETHYLBUTANE



Which of these bonds is the most polar? Which is the least polar?

C-H C-C C-O C-N

Using your choice of the most polar bond from the previous question, draw a Lewis structure for any simple compound containing this bond and use arrows to indicate the polarity of the molecule.



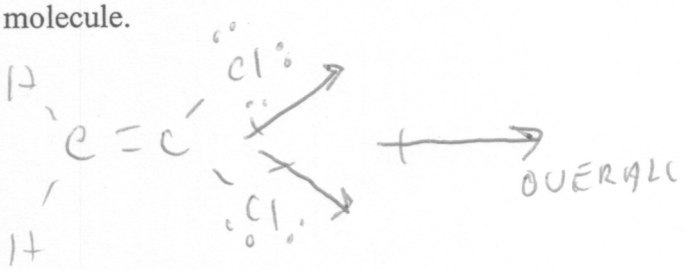
Which of these molecules is the most polar? Which is the least polar?

$CH_2=CCl_2$ MOST

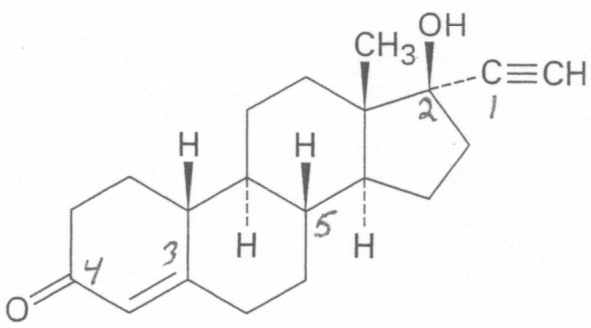
$CCl_2=CCl_2$ LEAST

$CHCl=CCl_2$

Using your choice of the most polar molecule from the previous question, draw a Lewis structure and use arrows to indicate the polarity of the bonds and the overall polarity of the molecule.



Indicate the hybridization and the geometry of the numbered atoms.



1 SP LINEAR

2 SP^3 TETRAHEDRAL

3,4 SP^2 TRIGONAL PLANAR

5 SP^3 TETRAHEDRAL

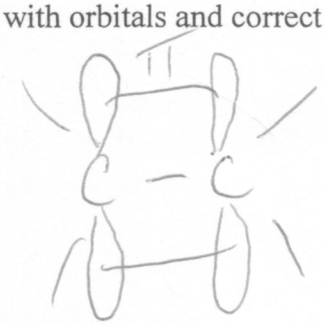
Norethindrone
(a synthetic progestin)

Rank these compounds in order of increasing water solubility. (1 = lowest, 4 = highest). Each compound has the same molecular weight.

an alkane, an alcohol, an ether, a salt

1 3 2 4

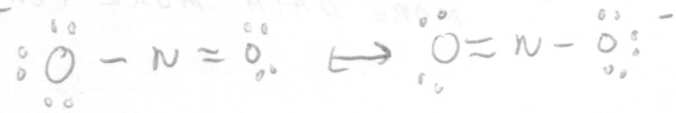
Draw a double bond, complete with orbitals and correct geometry.



SP^2

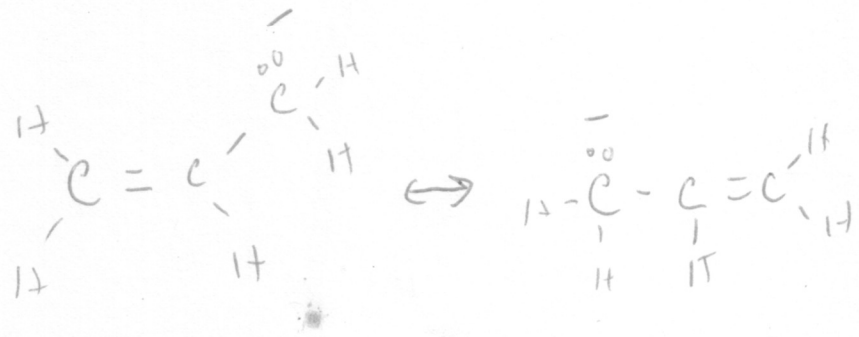
TRIGONAL PLANAR

Draw all resonance forms;



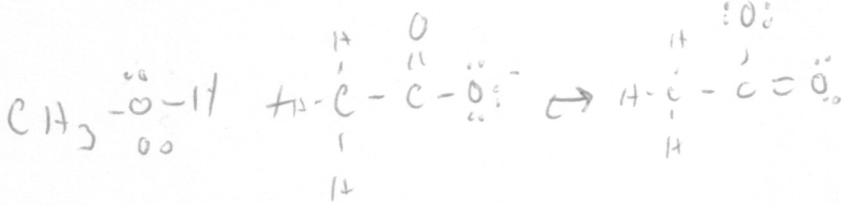
NO_2^-

$CH2=CH-CH_2^-$

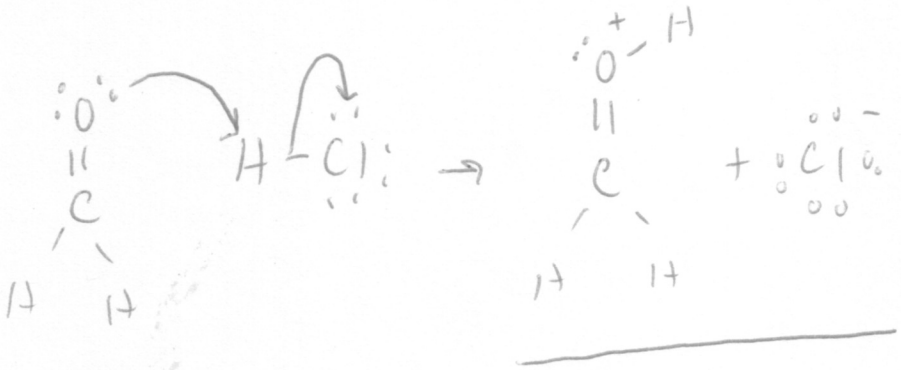


Complete the equations for these acid-base reactions. Label the conjugate acids and bases. Draw Lewis structures for the products, showing any relevant resonance forms.

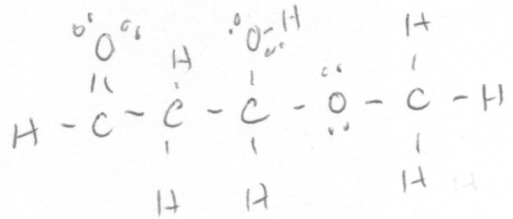
CH_3O^- + CH_3COOH →



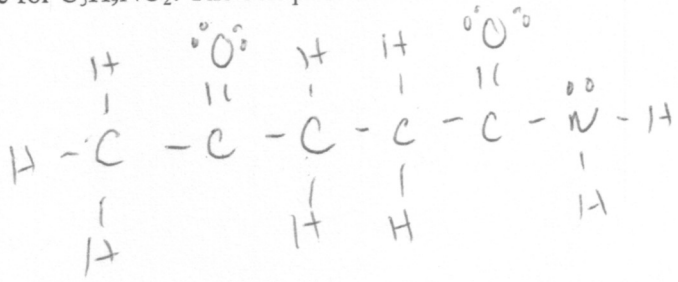
CH_2O + HCl →



4. Draw a Lewis structure for $C_4H_8O_3$. The compound must contain the functional groups of aldehyde, alcohol and ether.

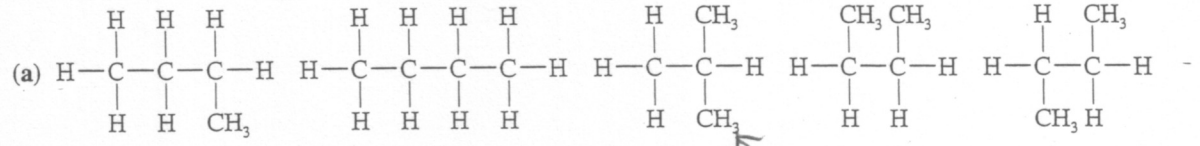


5. Draw a Lewis structure for $C_5H_9NO_2$. The compound must contain the functional groups of ketone and amide.



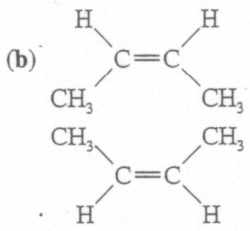
Which of the following Lewis structures represent the same compound? Which ones represent different compounds?

(a)

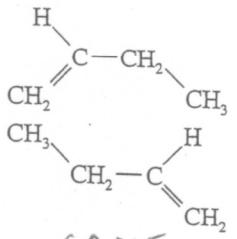


ALL n-BUTANE EXCEPT 2-METHYL PROPANE

(b)

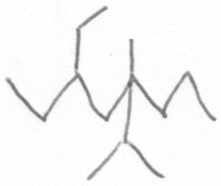


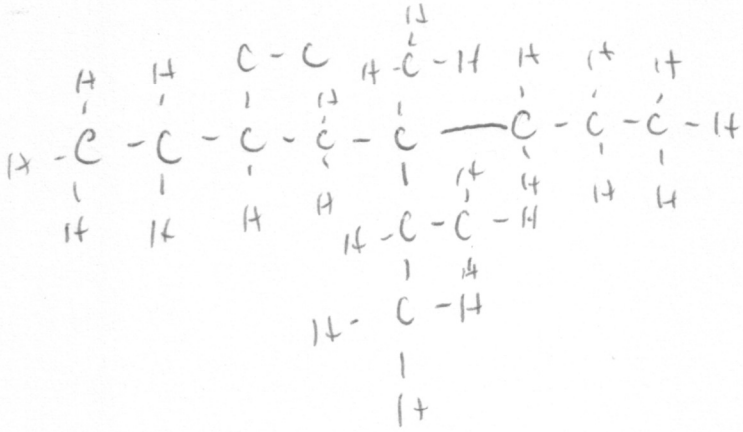
SAME



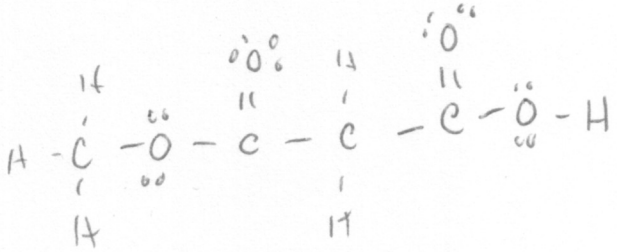
SAME

2. Draw a Lewis structure and a line/angle structure for 3-ethyl-5-methyl-5-isopropyloctane.





3. Draw a Lewis structure for $C_4H_6O_4$. The compound must contain the functional groups of ester and carboxylic acid.



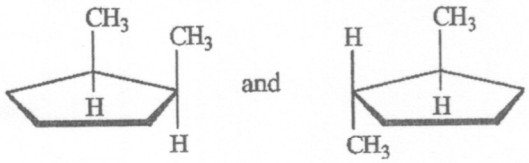
Name: _____

CHM 227 Summer 2014 Exam 2

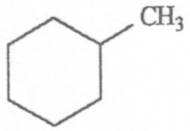
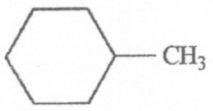
Matching

Instructions: Label each pair of compounds below as:

a. identical
b. structural isomers
c. stereoisomers

C 1.  and

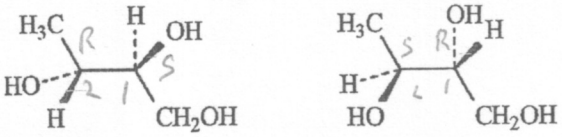
CIS & TRANS

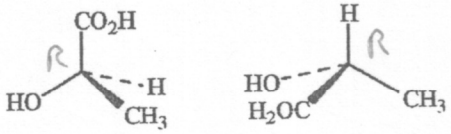
A 2.  and 

Instructions: Label each pair of molecules below as:

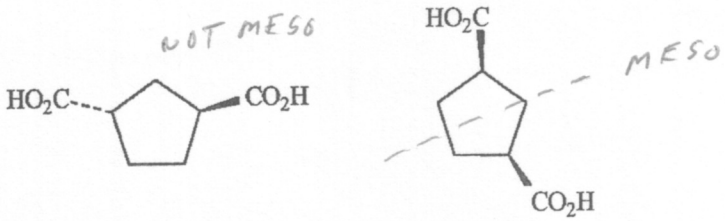
a. enantiomers
b. diastereomers
c. identical

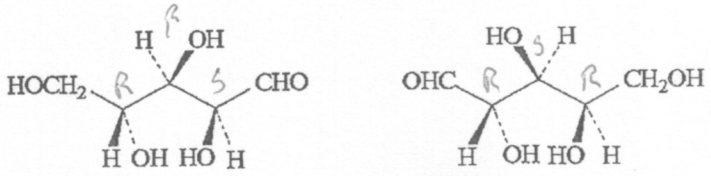
1S, 2R 1R, 2S

A 3. 

C 4. 

NOT MESO MESO

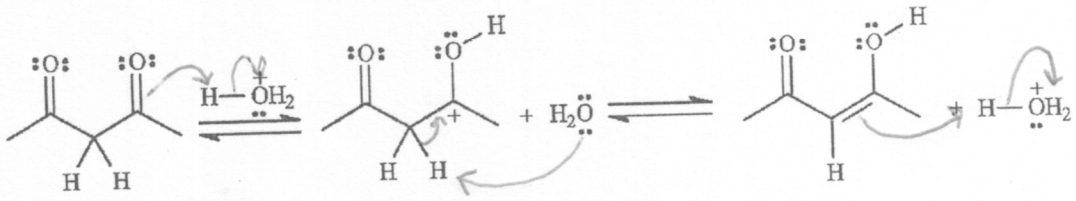
B 5. 

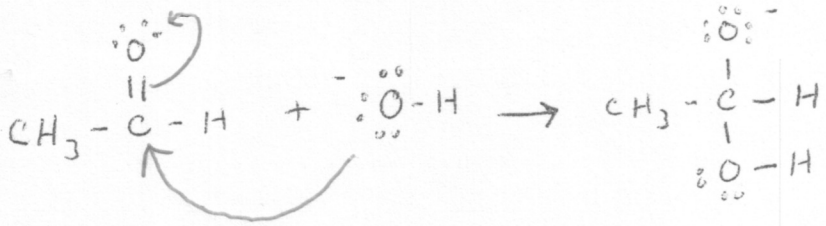
B 6. 

RRS 1S 2R 3R

RSR 1S 2S 3R

19. The structures below show the stepwise bond making and bond breaking in this reaction. Draw curved arrows to show the electron flow that has occurred in each step.

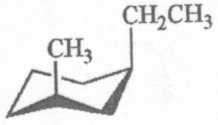


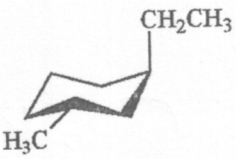


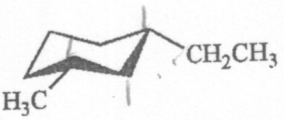
Multiple Choice

Identify the choice that best completes the statement or answers the question.

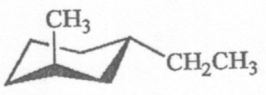
D E 20. Which of the following is the most stable conformation of *trans*-1-ethyl-3-methylcyclohexane?

a. 

b. 

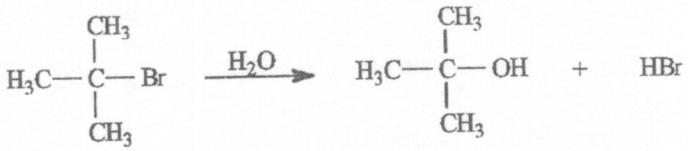
c. 

ALL EQUATORIAL BUT NOT TRANS

d. 

LARGEST GROUP EQUATORIAL

Instructions: Consider the reaction of 2-bromo-2-methylpropane with water, shown below, to answer the following question(s).

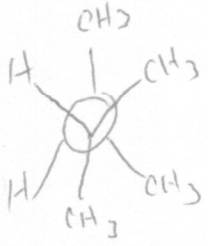


A

25. Refer to instructions. This reaction is an example of:
    a. a substitution reaction.
    b. a rearrangement reaction.
    c. an elimination reaction.
    d. an addition reaction.

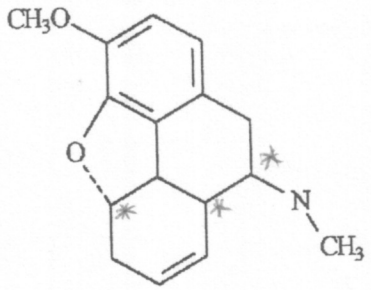
Short Answer

26. Draw a Newman projection, looking down the 2,3 bond, of 2,3-dimethylbutane.



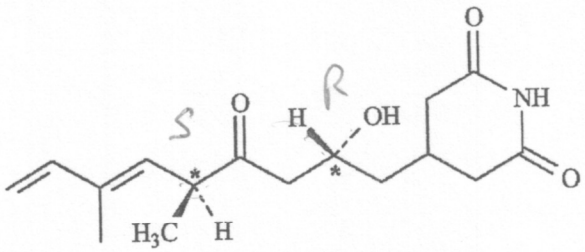
Instructions: Place asterisks at all the chirality centers in each molecule below.

14. Place asterisks:



codeine

Instructions: Consider the structure of streptimidone below to answer the following question(s).



streptimidone

15. Refer to instructions. Assign *R* or *S* configuration to each chirality center indicated in streptimidone.

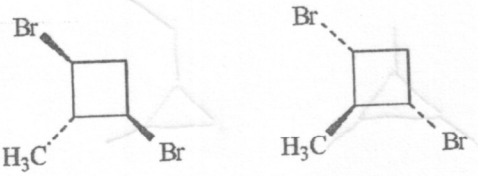
16. Refer to instructions. Does streptimidone have a *meso* stereoisomer? Explain. NO NOT SYMMETRIC

Instructions: Add curved arrows to the following reaction(s) to indicate the flow of electrons in each.

17. Indicate flow:

18. Indicate flow:

C

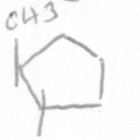
7. 

EXACT OPPOSITES SO THEY ARE JUST FLIPPED OVER — IDENTICAL

Problem

8. Draw and name five structural isomers for cycloalkane, C_6H_{12}.

CYCLO HEXANE



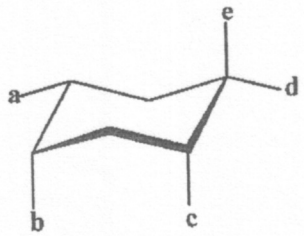
METHYL CYCLO PENTANE

CIS-1,2-DIMETHYL CYCLOBUTANE

TRANS-1,2-DIMETHYLCYCLOHEXANE

TRANS-1,3-DIMETHYLCYCLOBUTANE

Instructions: Refer to the structure below to answer the following question(s).

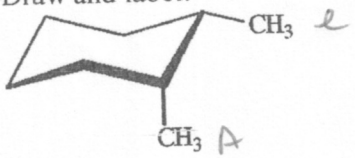


9. Refer to instructions. Which of the labeled groups in the structure are *equatorial*? A + D

10. Refer to instructions. Which of the labeled groups is *trans* to **b**? E

Instructions: For the disubstituted cyclohexane below, draw its ring-flip conformer. Label the substituent groups as axial or equatorial. Name the compound.

11. Draw and label:



e

A

CH3 A

CH3 e

CIS

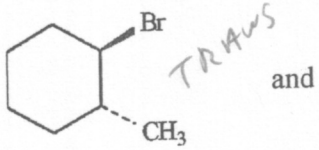
~~TRANS~~ 1,2-DIMETHYL CYCLOHEXANE

Instructions: Label each pair of compounds below as:

a. identical
b. stereoisomers
c. structural isomers
d. identical, but differing in conformation

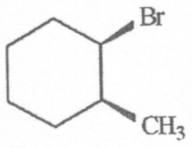
Where stereoisomers are present, label the isomers as *cis* and *trans*.

12. Label:



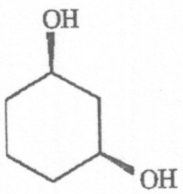
TRANS

and

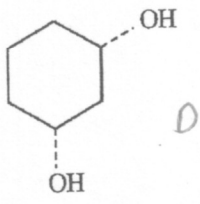


B CIS

13. Label:

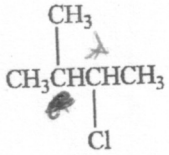


and



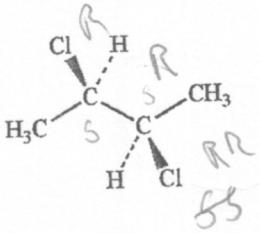
D ~~CIS~~

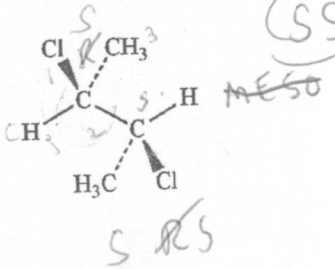
B D 21. How many stereoisomers of 3-chloro-2-methylbutane exist?



a. 1
b. 2
c. 3
d. 4

B A 22. What is the relationship between the following pair of structures?





a. They are enantiomers
b. They are diastereomers
c. The are structural isomers
d. They are identical

A 23. Which of the following correctly compares the two elements in terms of polarizability?

a. S > O
b. F > Br
c. N > P
d. Cl > I

B 24. How many monochlorosubstitution products are possible for 2,3-dimethylbutane?

a. 1
b. 2
c. 4
d. 5
e. 6