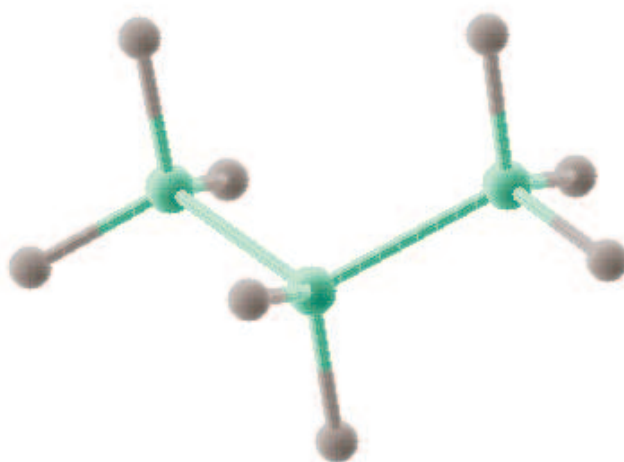


Chemistry 331

Organic Chemistry I

Exam 1



Force Field: MMX Hydrogens: On Natom: 11 HBond: Off Dielc: 1.5 Electstat: q-q

Name _____

(please print)

Q1: 10

Q2: 5

Q3: 5

Q4: 10

Q5: 10

Q6: 10

Q7: 5

Q8: 5

Q9: 5

Q10: 10

Q11: 10

Q12: 5

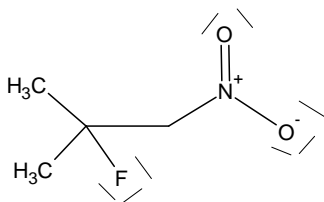
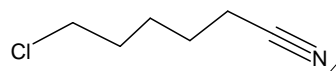
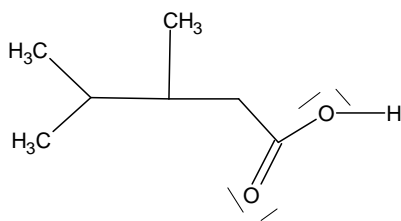
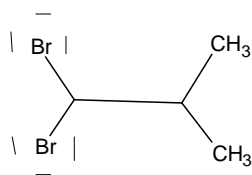
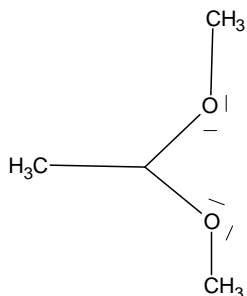
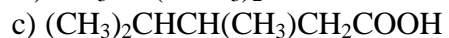
Q13: 5

Q14: 5

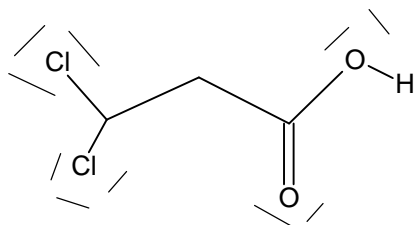
Q15: 10

TOTAL: 110

1. Expand the condensed structures to show the covalent bonds and nonbonding pairs of electrons (10 points).



2. Draw the Lewis dot structure of dichloropropionic acid, $\text{Cl}_2\text{CHCH}_2\text{COOH}$. (5 points)



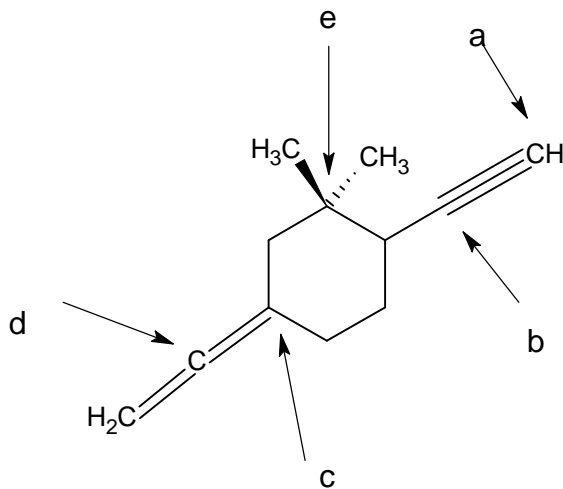
3. Indicate which of the following molecules would you expect to have a dipole moment, which would you expect to have NO dipole moment? (5 points)

a) CH_3CH_3	b) CHBr_3	c) $\text{N}^+(\text{CH}_3)_4$	d) HCOOH	e) $\text{H}_2\text{C}=\text{CH}_2$
NO	YES	NO	YES	NO

4. Predict the bond angles for the following molecules Also give the hybridization of the middle atom (10 points).

a)	C-N-H in	$(\text{CH}_3)_2\text{NH}$	angle: 109	hybridization N	:SP3
b)	C-C-C in	CH_3COCH_3	angle: 120	hybridization CO	:SP2
c)	C-O-C in	$\text{CH}_3\text{CH}_2\text{OCH}_3$	angle: 109	hybridization O	:SP3
d)	H-C-H in	$\text{H}_2\text{C}=\text{O}$	angle: 120	hybridization C	:SP2

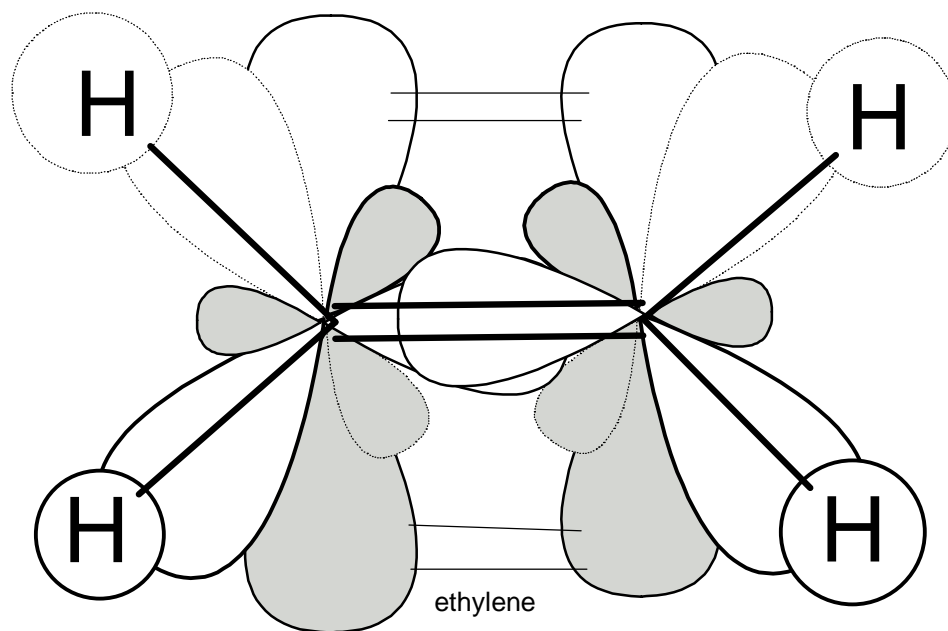
5. For the following compound:



What is the hybridization (sp^3 , sp^2 , sp , etc.) at each of the carbon atoms indicated? (10 points)

a)	b)	c)	d)	e)
Sp	sp	sp2	sp	sp3

6. Draw and discuss the bonding scheme for ethene ($\text{H}_2\text{C}=\text{CH}_2$) using valence bond theory. Be sure to include hybridization, bond angles, σ - and π -bonding as well as molecular geometry. (10 points)



H: s

C: sp^2

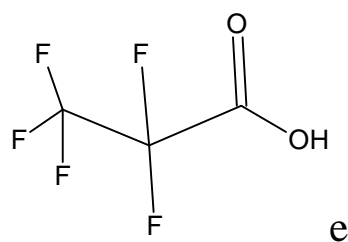
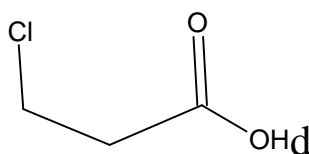
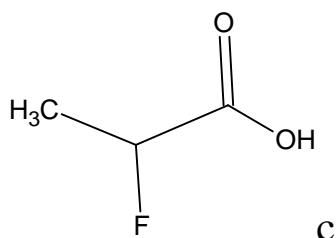
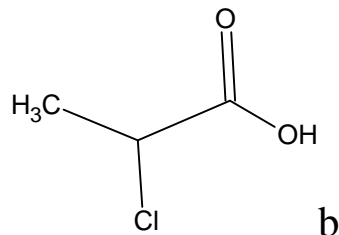
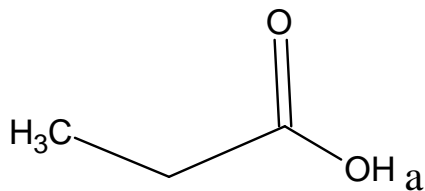
4x H(s)-C(sp^2)- σ -bonds

1x C(sp^2)-C(sp^2) - σ -bonds

1x C(p)-C(p) - π -bond

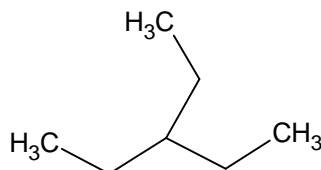
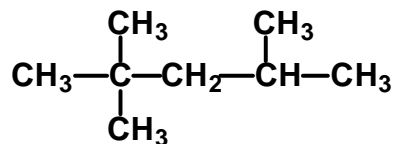
C: trigonal planar, bonding angle: 120 Degrees

7. Arrange the following compounds in order of *increasing* acidity (5 points):



$a < d < b < c < e$

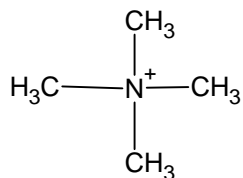
8. Isooctane (C_8H_{18}) is a major constituent of commercial gasoline. What is the IUPAC name for isooctane? Also draw the structure of 3-ethylpentane (5 points).



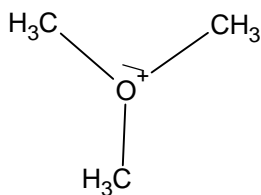
2,2,4-trimethyl-pentane

3-ethyl-pentane

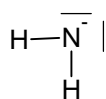
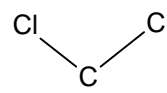
9. Give each atom the appropriate formal charge. (5 points)



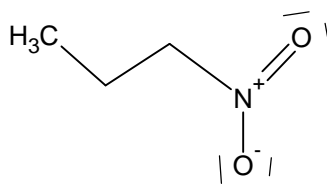
N: +1



O: +1



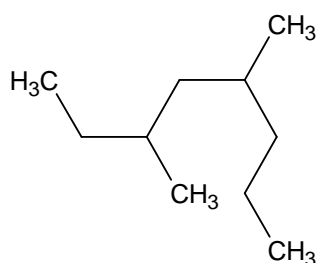
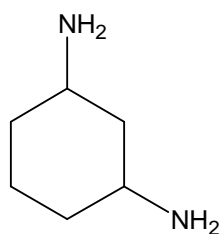
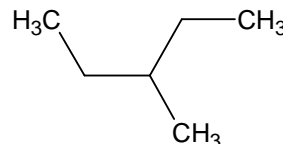
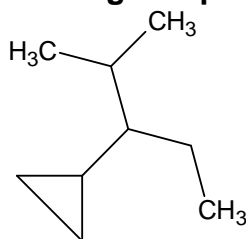
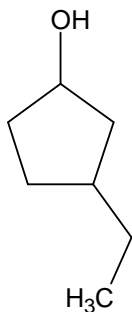
N: -1



N: +1, O1: -1, O2: 0

All other atoms : 0 charge

10. Give the IUPAC name of the following compounds. (10 points)

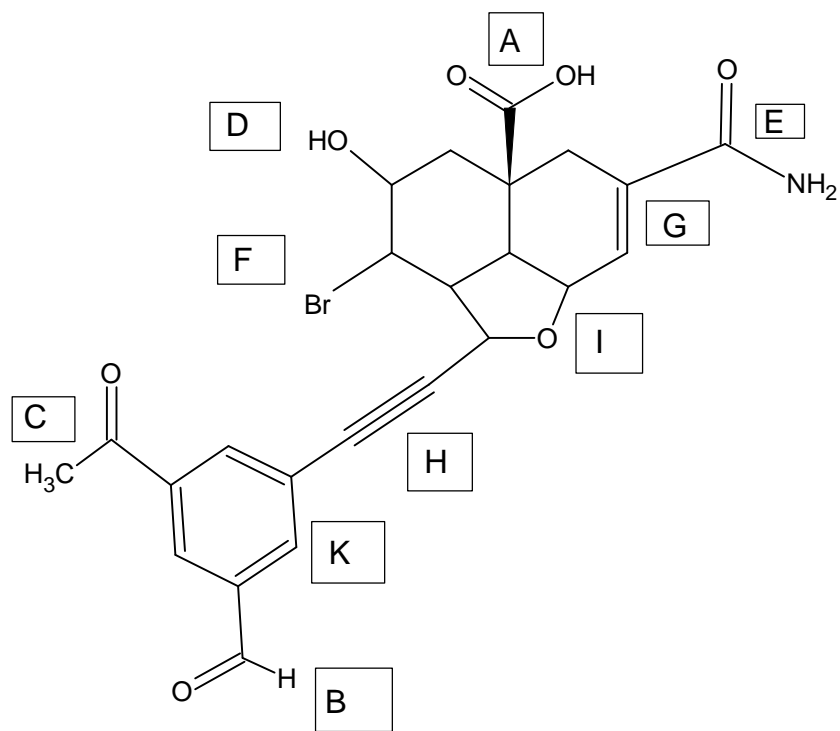


1-hydroxy-3ethyl-cyclopentane
1,3-diamino-cyclohexane

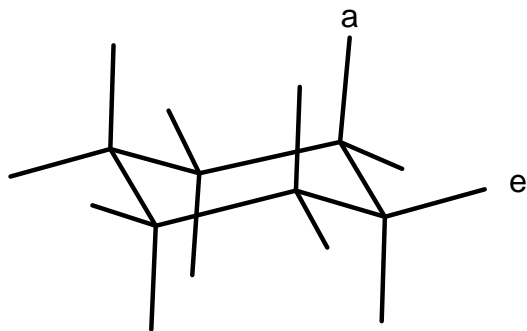
2-methyl-3cyclopropyl-pentane
3,5-dimethyl-octane 3-methyl-pentane

11. Identify all functional groups in the next drawing. (10 points). Use the following labels and place them into the appropriate boxes:

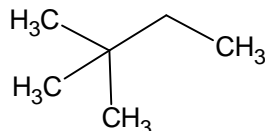
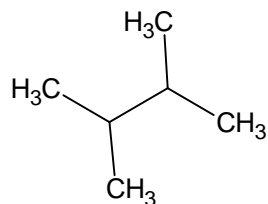
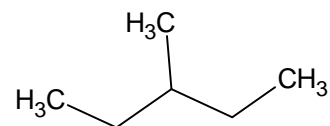
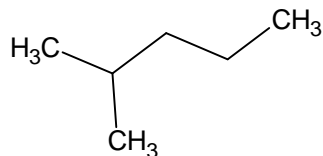
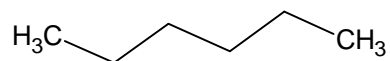
A: Acid, B: Aldehyde, C: Ketone, D: Alcohol,
E: Amide, F: Halogenide, G: Olefin, H: Alkyne,
I: Ether, K: Aromatic Ring, L: Amin,



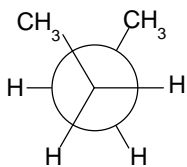
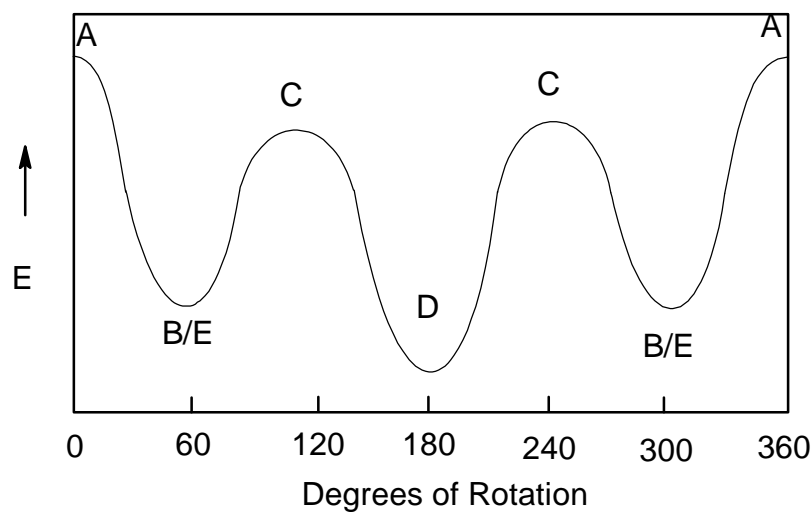
12. Draw the “chair” three-dimensional conformation of cyclohexane and label one of the *axial* hydrogens and one of the *equatorial* hydrogens. (5 points)



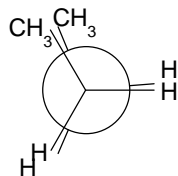
13. Draw all five constitutional isomers of hexane C₆H₁₄. (5 points)



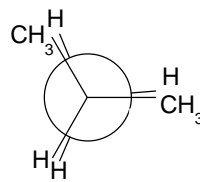
14. Assign the different conformations of butane to the potential energy diagram. (5 points)



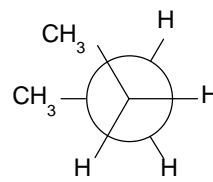
B Gauche



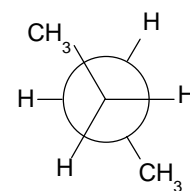
A Eclipsed



C Eclipsed



E Gauche



D Anti

15. Draw an example of a compound of your own choice for each entry, which has the following functional group:(10 points)

- a.) alcohol
- b.) aldehyde
- c.) ester
- d.) amin
- e.) carboxylic acid

