Department of Chemistry
University of Vermont

Chem 141
Fall, 1998
Exam 1

Name:

Score:_____

Problem	points (total)	Grader
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	_____	_____
	_____	_____
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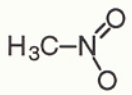
1. Define organic chemistry. (2 points)

2. Write a proper Lewis structure for each of the following compounds. Include lone pairs and indicate the formal charge on any charged atoms in the structure you propose. Formulas (a) (b) and (d) do not represent molecular formulas. They represent condensed structural formulas. (4 points)

(a) $(CH_3)_3O$

(b) CH_3CO_2H

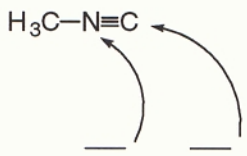
(c) 

(d) $HCONH_2$

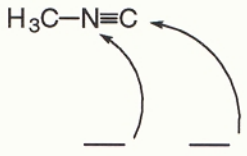
3. (a) Methyl isonitrile has an overall formal charge of zero. Draw a proper Lewis structure for methyl isonitrile (shown below). (1 point)

$H_3C–N{\equiv}C$

(b) On the line provided, give the formal charge for the specified atoms. (2 points)

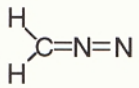


(c) On the line provided, give the hybridization for the specified atoms. (2 points)

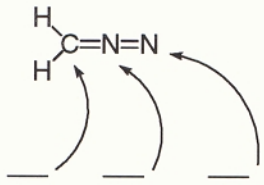


(d) Use the curved arrow method to depict the electron flow that would result in a contributing resonance structure for which all atoms have a formal charge of zero and provide that resonance structure. (3 points)

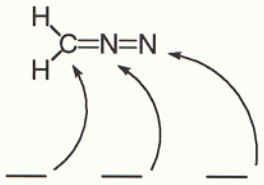
4. (a) Draw a proper Lewis structure for diazomethane (shown below). (1 point)



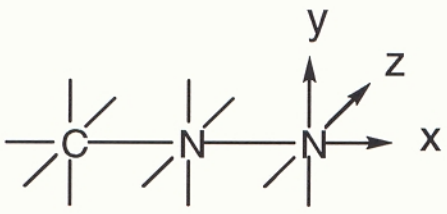
(b) On the line provided, give the formal charge for the specified atoms. (3 points)



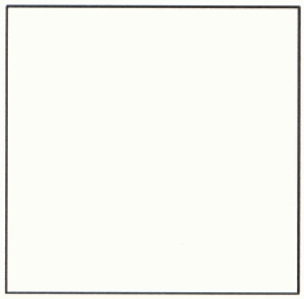
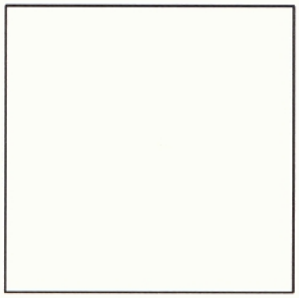
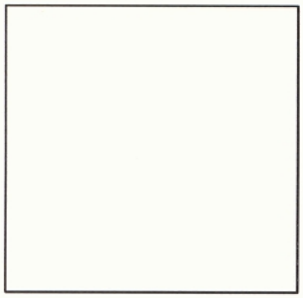
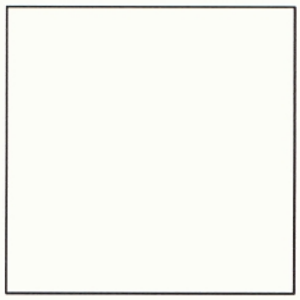
(c) On the line provided, give the hybridization for the specified atoms. (3 points)



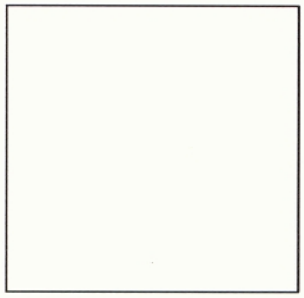
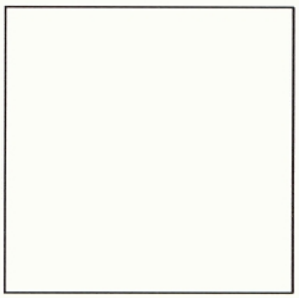
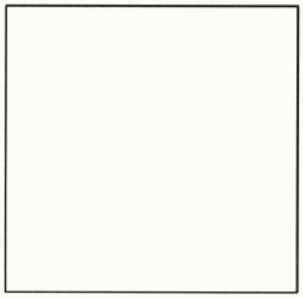
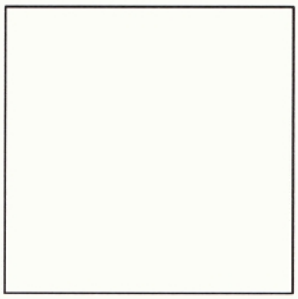
(d) Draw on the appropriate axes **only** the p-orbitals involved in π-bonds. (2 points)



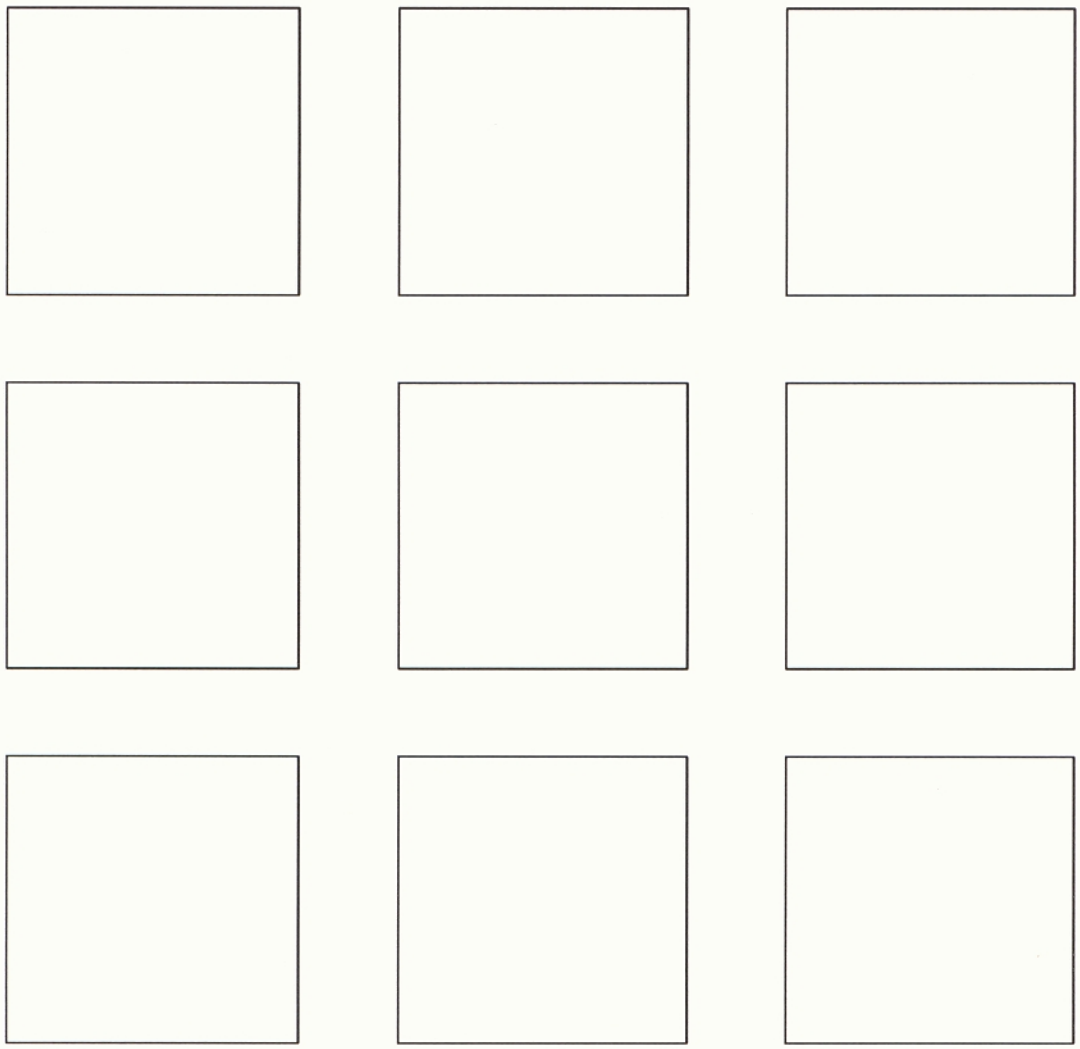
4. Using bond line formulas, draw 4 constitutionally isomeric ketones that have the formula C_4H_9NO. (4 points)

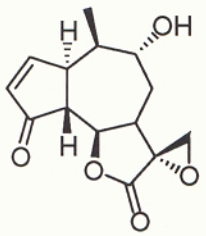
5. Using bond line formulas, draw 4 constitutional isomers that have the formula C_6H_{10} and do not have a double bond or a triple bond. (4 points)

6. Using bond line formulas, draw 9 constitutional isomers that have the formula C_4H_5Cl. (9 points)



7. For the following compounds, circle each of the functional groups, label each of the functional groups with a letter (a, b, c, ...) and in the space below the structure give the names of the functional groups that are present in the molecule. (10 points)



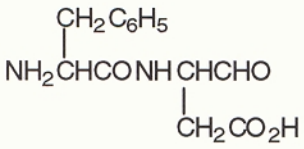
a_____

b_____

c_____

d_____

e_____



a_____

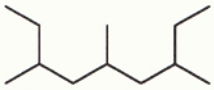
b_____

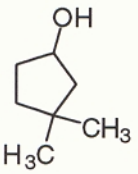
c_____

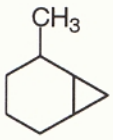
d_____

e_____

8. Provide IUPAC names for the following compounds. (8 points)

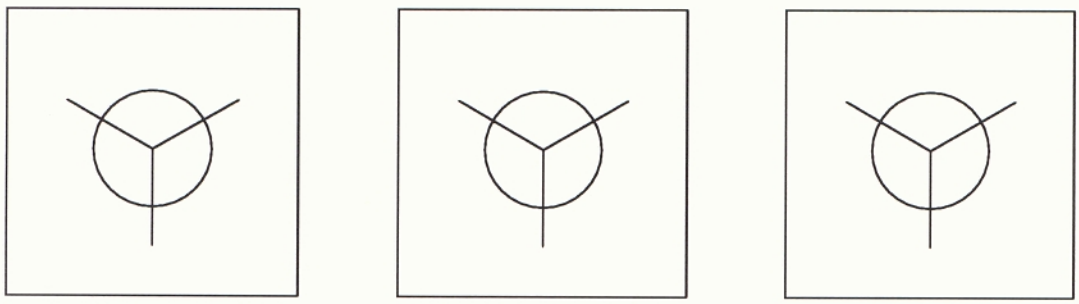
a. 

b. 

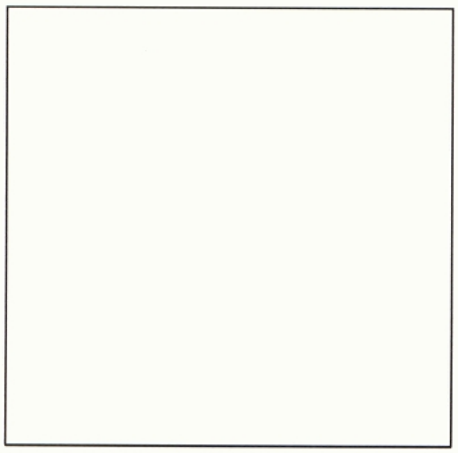
c. 

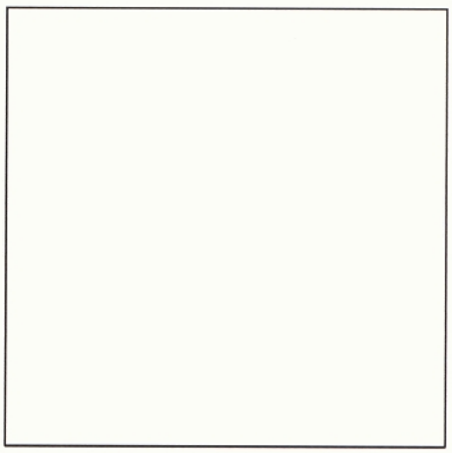
d. $CH_3CH_2CHClC(CH_3)_2CH_2CH(CH_2CH_3)CH_3$

9. Draw Newman projection formulas for the three conformational energy minima of 2,3-dimethylbutane as viewed through the C2-C3 bond and circle the most stable of these conformations. (4 points)

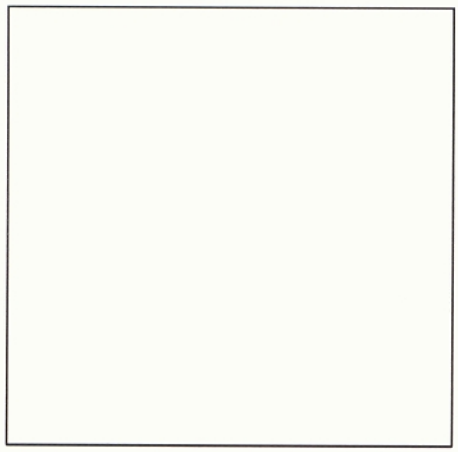


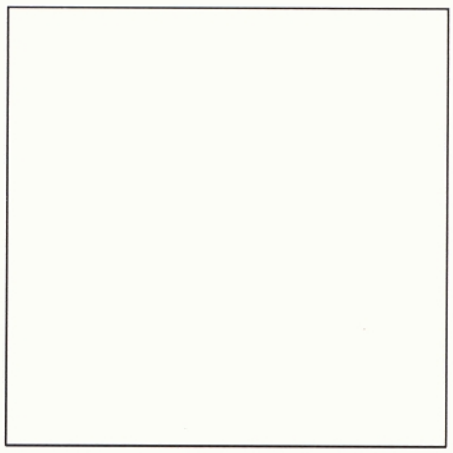
10 Draw the two possible chair conformations for 1,1,2-trimethylcyclohexane. Clearly indicate whether the substituents are axial (a) or equatorial (e). Circle the most stable of the two. (6 points)



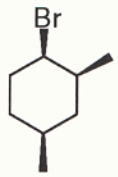


11. Draw the two possible chair conformations for 1,1,3-trimethylcyclohexane. Clearly indicate whether the substituents are axial (a) or equatorial (e). Circle the most stable of the two. (6 points)

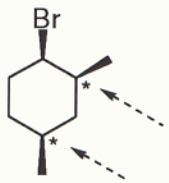




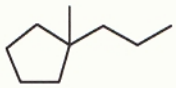
12. (a) Draw the two possible chair conformations for the tri-substituted cyclohexane shown below. Clearly indicate whether the substituents are axial (a) or equatorial (e). Circle the most stable of the two. (6 points)



(b) Using Newman projection formulas, draw the two possible chair conformations for the trisubstituted cyclohexane shown below such that they are viewed through the axes indicated by arrows and with the *-carbons in the front. (6 points)



13. Provide all isomers (*all* isomers possible) possessing one double bond that on treatment with H_2 and Pd-C would give the compound below. (6 points)



14. Draw a bond line formula for 1,1,2R-trimethylcyclohexane. (Yes this enantiomer). (2 points)