

Midterm 1

Student ID

KEY

page

points:

2 _____ (24)

3 _____ (18)

4 _____ (24)

5 _____ (18)

6 _____ (8)

7 _____ (8)

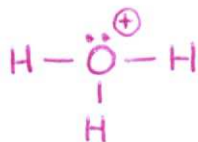
Total _____ (100)

Periodic Table

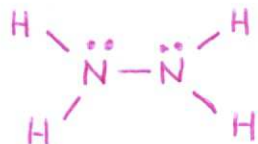
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Ha	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

1. A) Draw the Lewis structures of the following compounds. Include formal charges in the Lewis structures (6 pts).

(a) H_3O^+

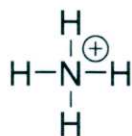


(b) H_2NNH_2



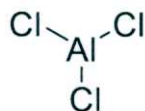
B) Predict the geometry of the following molecules using the VSEPR model (6 pts).

(a)



Tetrahedral

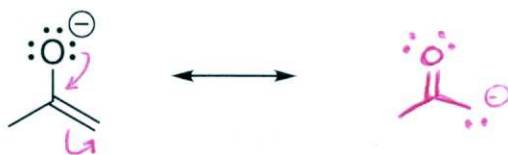
(b)



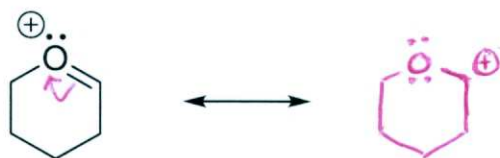
Trigonal Planar

C) For each of the following molecules: draw one additional resonance structure and use curved-arrow notation to show how the second resonance structure can be derived from the first (12 pts).

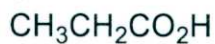
(a)



(b)



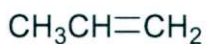
2. A) Rank the following compounds in order of increasing acidity (6 pts).



A

4

(3)



B

2

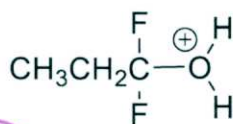
(5)



C

5

(2)



D

6

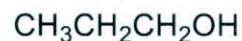
(1)



E

1

(6)



F

3

(4)



B) Which of the following are likely to act as Lewis Acids? (3 pts)



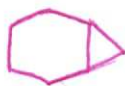
C) Which of the following are likely to act as Lewis Bases? (3 pts)



3. Please draw an alkane with 7 carbons, none of which are primary and exactly 2 of which are tertiary (6 pts).



or

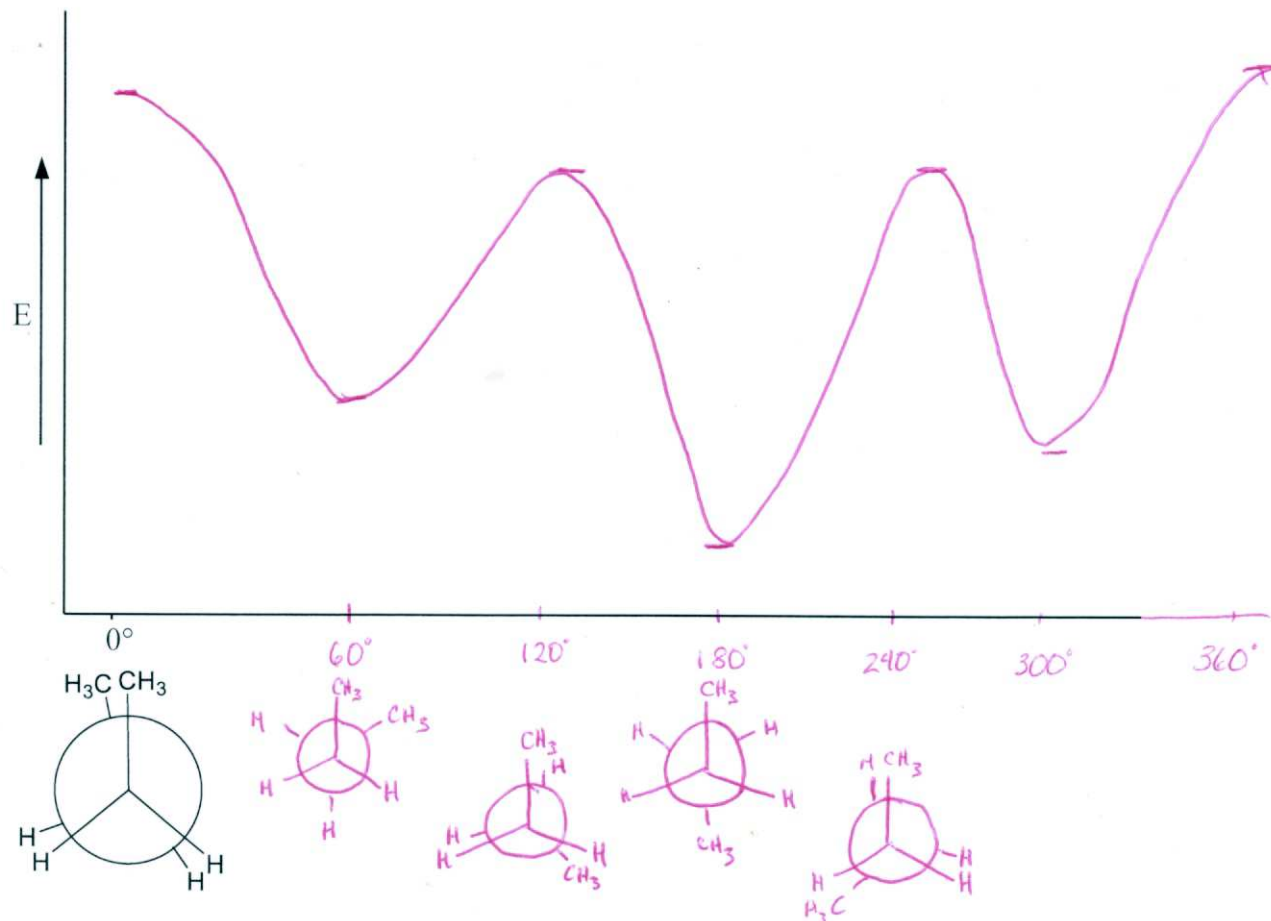


or

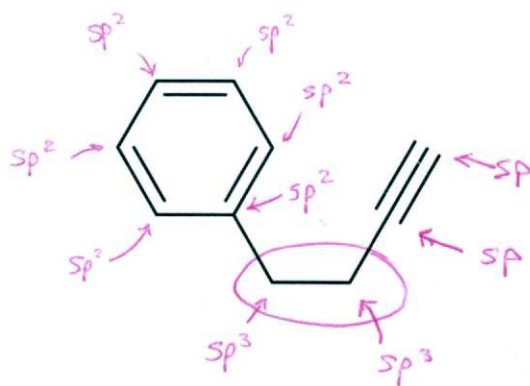


and more

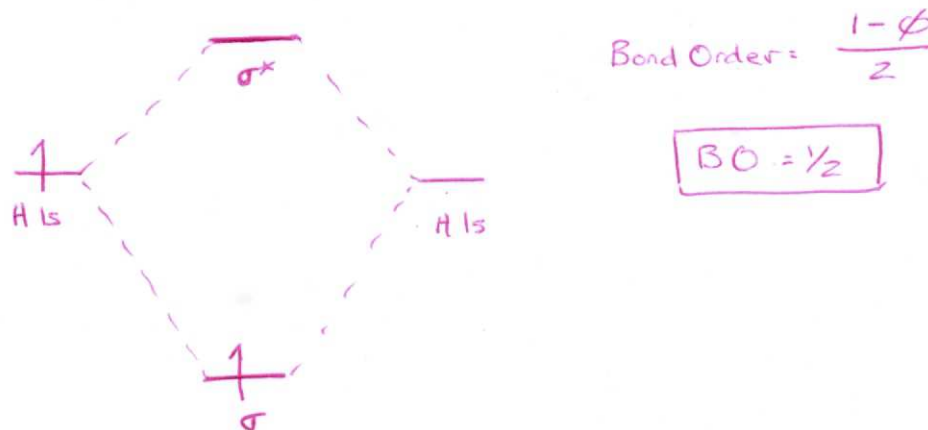
4. Draw a potential energy diagram for rotation about the C2—C3 bond in butane. Draw the Newman projections for the dihedral angles 60° , 120° , 180° , and 240° (18 pts).



5. What is the hybridization of each carbon atom in the following molecule? (3 pts) Circle the longest C-C bond (3 pts).



6. Draw the molecular orbital diagram of H_2^+ and calculate the bond order. Be sure to pay attention to the starting energies of your atoms, and to the energy of the resulting orbitals. (8 pts)



7. A) Draw the structures for five constitutional isomers of the molecular formula C_7H_{16} and give their IUPAC names (10 pts).



n-heptane



3,3-dimethylpentane



2-methylhexane



3-ethylpentane



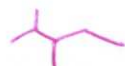
3-methylhexane



2,2-dimethylpentane



2,2,3-trimethylbutane

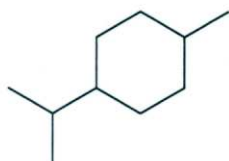


2,3-dimethylpentane



2,4-dimethylpentane

B) Give the IUPAC name for the following structure (2 pts).



1-isopropyl-4-methylcyclohexane

C) Draw the skeletal structures that correspond to the following names: (6 pts)

(1) 1-ethyl-1-methylcyclopentane

(2) 4-sec-butyl-6,6-diethyl-3-methyloctane

(3) 4-isopropyl-2,2,3,5-tetramethylheptane

(1)



(2)



(3)



8. Provide a curved-arrow notation for each of the following reactions in the left-to-right direction. (8 pts)

