CHEM3311-200 Wang Fall 2013 Midterm 1

Student ID _____ Name _____

TA Name _____

page	points:
2	_____(20)
3	_____(19)
4	_____(24)
5	_____(22)
6	_____(15)
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															

Please sit with an empty seat between you and your neighbors.

Please silence your cell phones and keep them in your bags during exam.

You may use molecular models. Please bring them in transparent bags.

Feel free to ask questions about the questions, but please don't ask questions about your answers, it distracts your neighbors.

1. Draw the best Lewis structure for each species shown below. Lone pairs and formal charges much be included. (10 pts).

a) ozone O_3

b) sodium carbonate Na_2CO_3

c) sulfite ion SO_3^{2-}

d) nitromethane CH_3NO_2

e) tetrafluoroborate ion BF_4^-

2. Provide the shape of the following species and hybridization of the central atom. (10 pts)

a) SO_4^{2-}

b) $SiCl_4$

c) N_2O

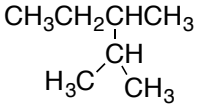
d) BF_3

e) NH_3

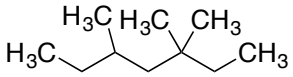
3. Provide all constitutional isomers for alkane C_6H_{14} using bond-line formulas. (10 pts)

4. Provide the IUPAC names of the following structures and circle all tertiary carbons (9 pts)

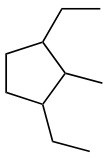
a)



b)



c)

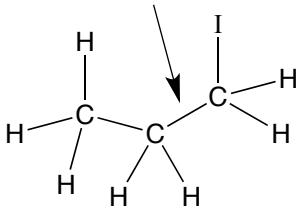


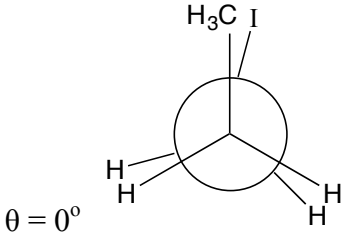
5. Draw the structure of the following molecules and circle all quaternary carbons (6 pts).

a) 3-methyl-4,4-diethyloctane

b) 1,1-dimethyl-3-ethylcyclohexane

6. Draw the energy diagram as the dihedral angle (θ) of the indicated carbon-carbon bond of 1-iodopropane varies from 0^o (as shown) to 360^o. Draw appropriate Newman projections for conformations whose dihedral angles are 60^o, 120^o, 180^o, 240^o, 300^o, and 360^o. Please note that iodine has a similar Van der Waals radius as a methyl group (20 pts)

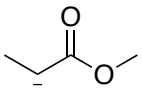




θ = 0^o

7. Draw the best resonance structure of the following species. Indicate the movement of electrons between resonance structures using the curved arrow notation. (12 pts)

a)



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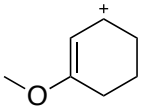

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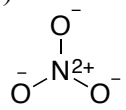
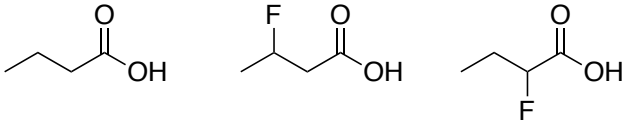


8. For each of the following series of acids, rank them according to their pKa values from high to low (10 pts).

a) H_2O, NH_3, HF, CH_4

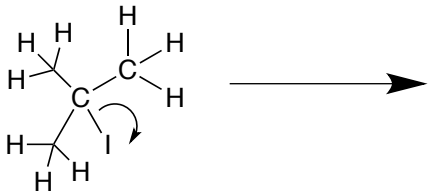
b) H_2O, CH_3SH, $CH_3SH_2^+$

c)

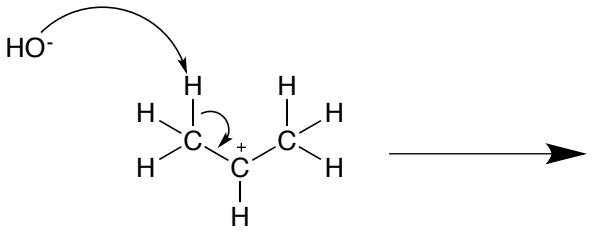


9. Provide the products of each of the following reactions based on the curved arrow notations (9 pts).

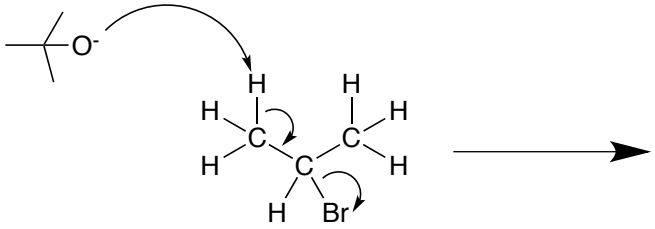
a)



b)

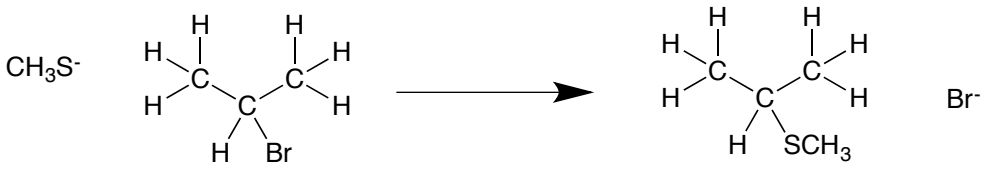


c)



10. Draw the missing arrows based on the starting materials and products of each reaction (6 pts).

a)



b)