

Student ID _____

Name KEY

Recitation Date/Time _____ TA Name _____

page

points:

2 _____ (32)

3 _____ (26)

4 _____ (28)

5 _____ (14)

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.

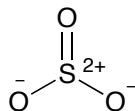
Please silence your cell phones and keep them in your bags during exam.

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.

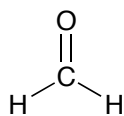
1. Draw the best Lewis structure for each species shown below. Formal charges much be included. Provide the shape of each species. (3 pts each) The central atoms are in bold.

a) sulfur trioxide **SO₃**



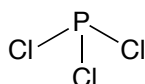
trigonal planar

b) formaldehyde **H₂CO**



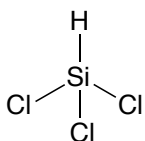
trigonal planar

c) phosphorus trichloride **PCl₃**



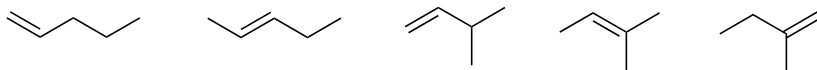
trigonal pyramidal

d) trichlorosilane **HSiCl₃**



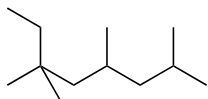
tetrahedral

2. Provide all constitutional isomers for C₅H₁₀ using bond-line formulas (2 pts each)



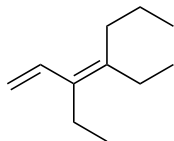
3. Provide the IUPAC names of the following structures (4 pts each).

a)



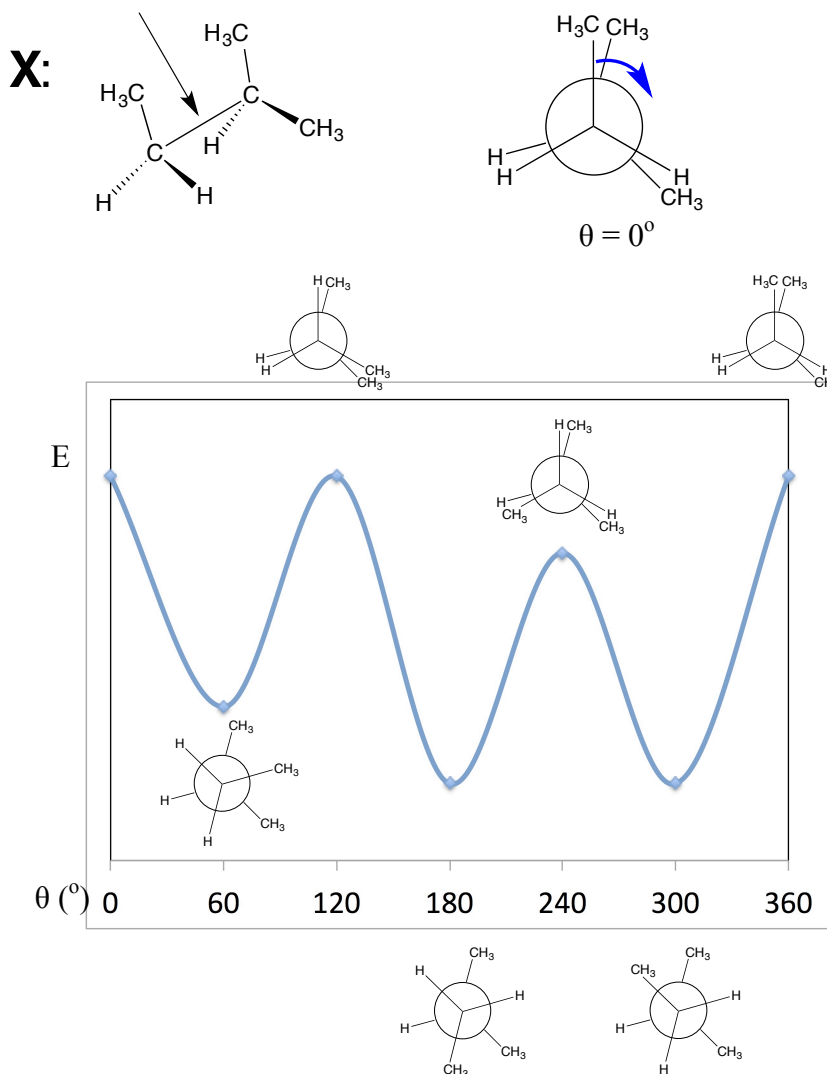
2,4,6,6-tetramethyloctane

b)



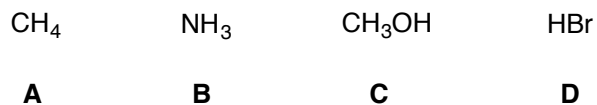
(Z)-3,4-diethyl-1,3-heptadiene

4. Draw the energy diagram as the dihedral angle (θ) of the indicated carbon-carbon bond of X varies from 0° (as shown) to 360° . Draw appropriate Newman projections for conformations whose dihedral angles are 60° , 120° , 180° , 240° , 300° , and 360° (18 pts). Please rotate the carbon in the front clockwise as the blue arrow indicated.



5. Identify the most and least acidic or basic species in each of the following series of molecules (3 pts each).

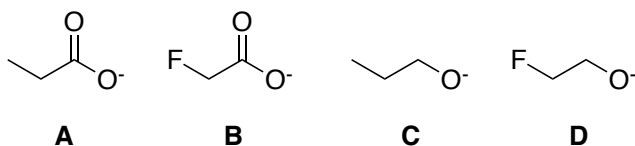
a)



Most acidic: **D**

Least acidic: **A**

b)

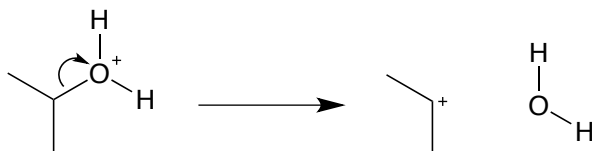


Most basic: **C**

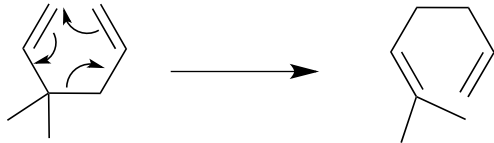
Least basic: **B**

6. Provide the products of each of the following reactions based on the curved arrow notations (4 pts).

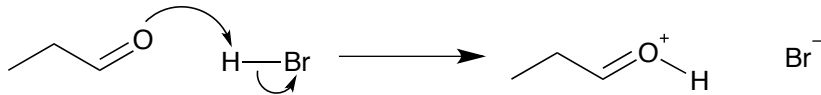
a)



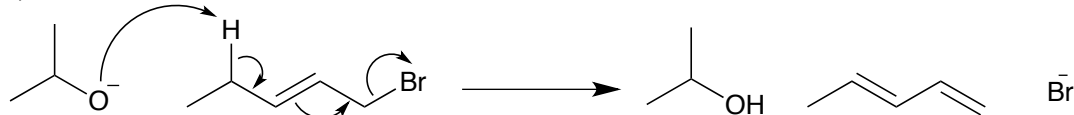
b)



c)



d)



e)



7. Use the curved arrow notation to draw the mechanism of the following reaction (10 pts).

