

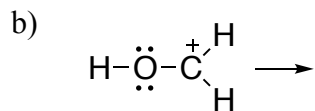
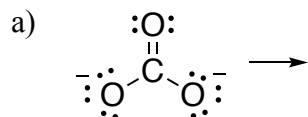
1. A) Provide Lewis structures for the following compounds. Show all unshared electrons and formal charges. (6 pts)



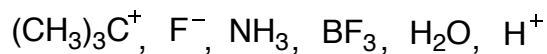
B) Predict the geometry of the following molecules using the VSEPR model. (6 pts)



C) For each of the following molecules: draw one additional resonance structure and use the curved-arrow notation to show how the second resonance structure can be derived from the first structure. Show all unshared electrons and formal charges. (6 pts)



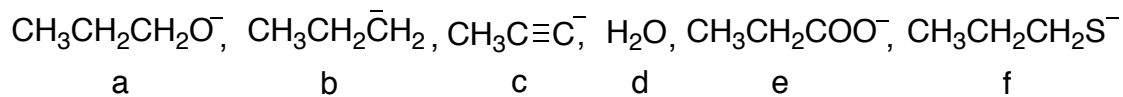
2. A) Which of the following are likely to act as Lewis acids and which as Lewis bases. (6 pts)



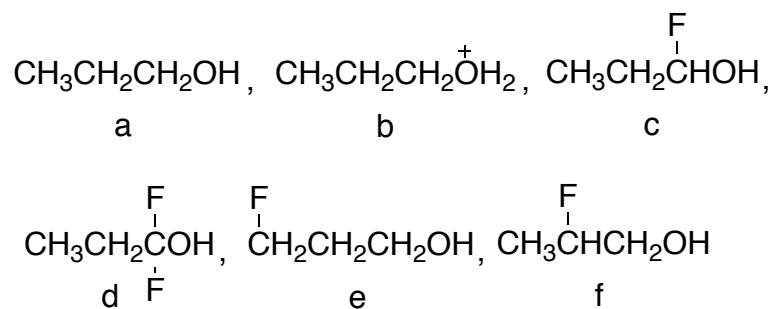
Lewis acids:

Lewis bases:

B) Rank the following Brønsted bases in strength from strongest to weakest. (6 pts)

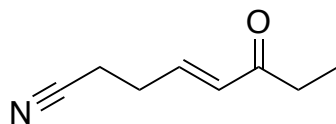


C) Rank the following Brønsted acids in strength from strongest to weakest. (6 pts)

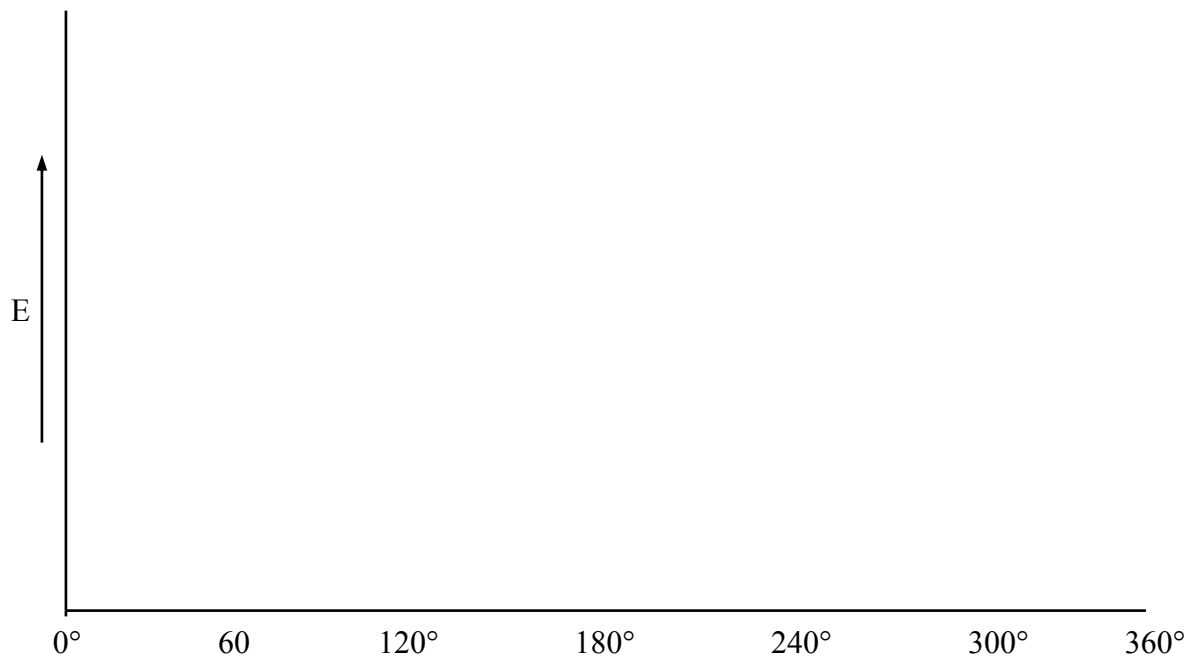


3. A) Please draw an alkane with 7 carbons, none of which are primary carbons and exactly 2 of which are tertiary carbons. (2 pts)

B) What is the hybridization of each carbon atom in the following molecule? (2 pts)



4. Draw an energy diagram for rotation about the C1—C2 bond in n-butane. Draw the Newman projections for the dihedral angles 0° , 60° , 120° , 180° , 240° and 300° . (18 pts)

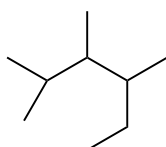


5. Draw the molecular orbital diagram of H_2^{2-} . Clearly label atomic and molecular orbitals, and indicate electron occupancy in each of these orbitals (4 pts). What is the bond order of H_2^{2-} ? (2 pts)

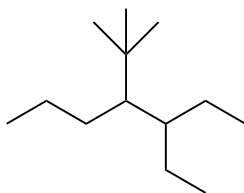
6. A) Draw the structures for all the constitutional isomers of alkanes with the molecular formula C_5H_{10} and provide the IUPAC name for each isomer. (12 pts)

- B) Provide the correct name for the following compounds. (12 pts)

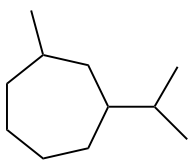
a)



b)

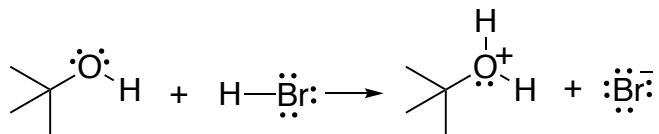


c)

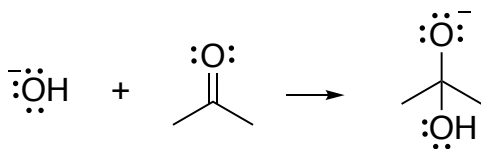


7. A) Provide the curved-arrow notation for each of the following reactions in the left-to-right direction. (6 pts)

a)

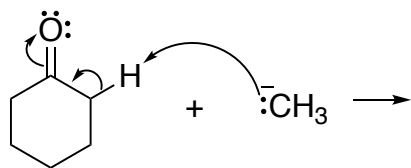


b)



B) Provide the product(s) for the following reactions. (6 pts)

a)



b)

