Name _____ Test 1 (10/6)
CHEM 0201 (Organic I) Fall 2023

1. a. (6 pts.) What is the ground state electron configuration for a chlorine atom (using the noble gas shorthand is acceptable). 1. _____

b. (2 pts.) In its ground state, how many unpaired electrons does a chlorine atom have? 2. _____

3. _____

2. The two most common isotopes of nitrogen are ^{14}N and ^{15}N.
a. (4 pts.) Subatomic particle wise, how are neutral atoms of ^{14}N and ^{15}N similar?
4. _____

b. (4 pts.) Subatomic particle wise, how are neutral atoms of ^{14}N and ^{15}N different? 5. _____

6. _____

c. (4 pts.) Would the atoms have similar or different chemical reactivity?

7. _____

d. (2 pts.) Which isotope would react more slowly?

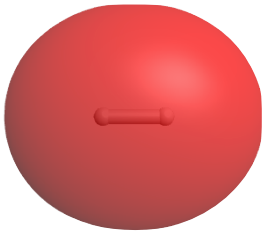
8. _____

3. Carbon is less electronegative than oxygen.
a. (6 pts.) How does this affect the distribution of electrons in a C to O bond? 9. _____

10. _____

b. (6 pts.) Explain why carbon is less electronegative than oxygen. Remember to base the explanation on the makeup of the atom and not simply its position on the periodic table. 11. _____

4. (8 pts.) The diagram below is a graphical representation of a bonding molecular orbital. What feature (or features) of the orbital accounts for the low energy of the electrons placed in this orbital and why does this make the electrons lower in energy as compared to electrons on the individual atoms.

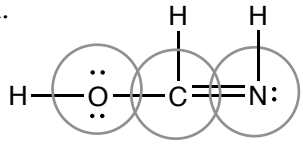


5. (16 pts.) Draw Lewis dot structures for the following condensed structures.

NH_2CHO | CHF_2CH_2OH

6. (8 pts) Determine the hybridization of the circled atoms in the structures drawn below. Lewis Kekulé, and condensed structures have been provided.

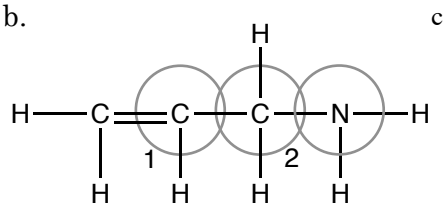
a.



O _____ C _____

N _____

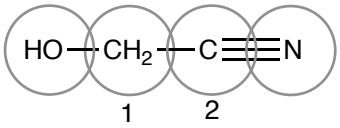
b.



C(1) _____ C(2) _____

N _____

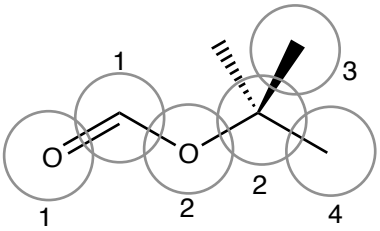
c.



O _____ C(1) _____

C(2) _____ N _____

7. a. (6 pts.) Determine the hybridization of the circled atoms in the following skeletal structure.

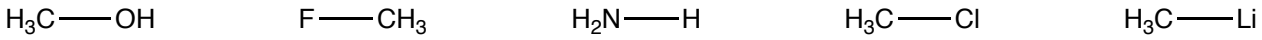


O(1) _____ C(1) _____ O(2) _____

C(2) _____ C(3) _____ C(4) _____

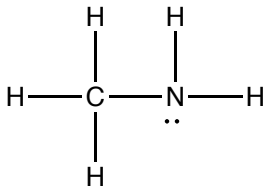
8. (8 pts.) Use valence bond theory to briefly describe a carbon to carbon double bond. In your description remember to identify the hybrid or atomic orbitals that are used to form the bonds and to identify the symmetry of the bonds (σ or π) that are formed. If you wish to draw a diagram to support your description, you may do so.

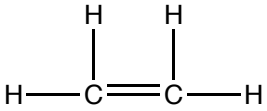
9. (10 pts.) Determine whether the following bonds are polar and place a δ^+ and a δ^- at the positive and negative ends of the bonds.



10. (10 pts.) Using wedge (◄) and dashed (┈┈) bonds where appropriate, draw 3-D representations of the following molecules and determine whether they are polar. If the molecules are polar place a δ^+ and a δ^- in the appropriate positions. If the molecule is not polar write the word nonpolar next to the drawing. Lewis and Kekulé structures are provided.

a.





11. (10 pts.) Determine the formal charges of the C and O atoms in a molecule of carbon monoxide. A Kekulé structure is provided.