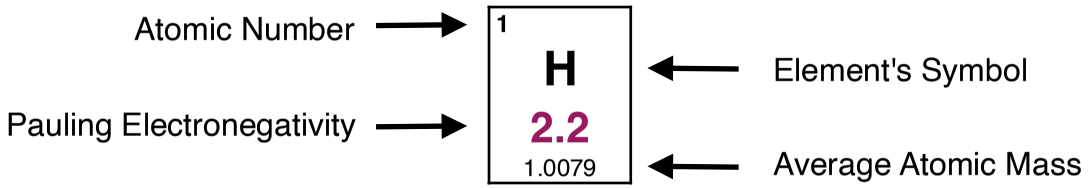
Some Electronegativities of Elements of Interest to Organic Chemists[1]

1 **H** 2.2 1.0079																	2 **He** 4.0026
3 **Li** 0.98 6.941	4 **Be** 1.57 9.012											5 **B** 2.04 10.811	6 **C** 2.55 12.011	7 **N** 3.04 14.007	8 **O** 3.44 15.999	9 **F** 3.98 18.998	10 **Ne** 20.1797
11 **Na** 0.93 22.989	12 **Mg** 1.31 24.305											13 **Al** 1.61 26.981	14 **Si** 1.90 28.086	15 **P** 2.19 30.974	16 **S** 2.58 32.065	17 **Cl** 3.16 35.453	18 **Ar** 39.948
19 **K** 0.82 39.098	20 **Ca** 1.00 40.078															35 **Br** 2.96 79.904	36 **Kr** 83.798
																53 **I** 2.66 126.90	



[1] Electronegativity values obtained from https://en.wikipedia.org/wiki/Electronegativity on September 28, 2023

Name _____ Test 1 (10/7)
CHEM 0201 (Organic I) Fall 2024

1. The two naturally occurring isotopes of chlorine are ^{35}Cl and ^{37}Cl.
   a. (4 pts.) Subatomic particle-wise, how are neutral atoms of ^{35}Cl and ^{37}Cl similar? 1. _____

   b. (4 pts.) Subatomic particle wise, how are neutral atoms of ^{35}Cl and ^{37}Cl different? 2. _____

   c. (4 pts.) Would the atoms have similar or different chemical reactivity; for example, would they form compounds with different formulas or similar formulas? 3. _____

   4. _____

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

   5. _____

2. Chlorine is less electronegative than fluorine.
   a. (6 pts.) How does this affect the distribution of electrons in a Cl to F bond? 6. _____

   7. _____

   b. (6 pts.) Explain why chlorine is less electronegative than fluorine. Remember to base the explanation on the makeup of the atom and not simply its position on the periodic table. 8. _____

   9. _____

   10. _____

   11. _____

3. (16 pts.) Draw Lewis dot structures for the following condensed structures.

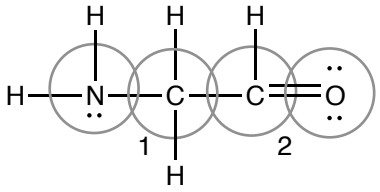
$CHOCH_2Cl$	CH_2CHCH_2SH

4. (10 pts.) Determine whether the following bonds are polar and if the bond is polar place a δ^+ and a δ^- at the positive and negative ends of the bonds.

$H_2N—CH_3$ $HS—CH_3$ $H_2N—Li$ $H_2P—H$ $H_3CO—CH_3$

5. (10 pts) Determine the hybridization of the circled atoms in the structures drawn below. Lewis Kekulé, and condensed structures have been provided.

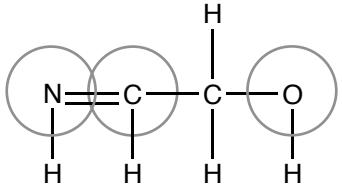
a.



N _____ C(1) _____

C(2) _____ O _____

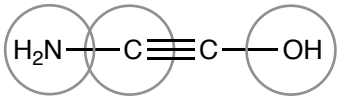
b.



N _____ C _____

O _____

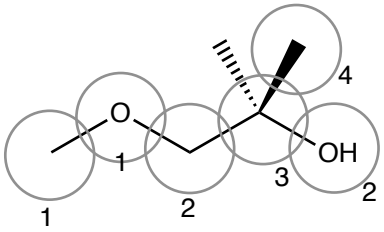
c.



N _____ C _____

O _____

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



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

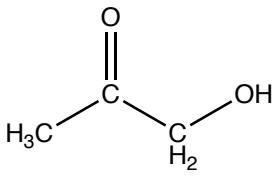
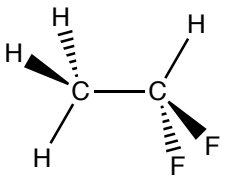
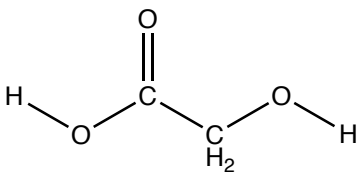
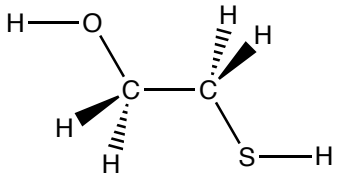
C(3) _____ C(4) _____ O(2) _____

7. (8 pts.) Use valence bond theory to briefly explain why all six atoms in H_2CCH_2 are in the same plane. In your explanation 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 explanation, you may do so.

8. (10 pts.) Rank the following acids in order of decreasing strength (1 for the strongest through 6 for the weakest).

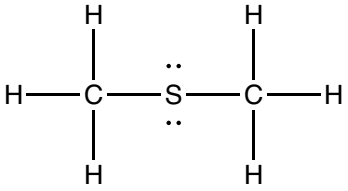
CH_3CH_2OH	HNO_3	H_2SO_4	CH_3CCH	ClC_6H_4OH	C_6H_5OH
(pK_a = 16.0)	(pK_a = –1.5)	(pK_a = –3)	(pK_a = 25)	(pK_a = 8.95)	(pK_a = 10.0)

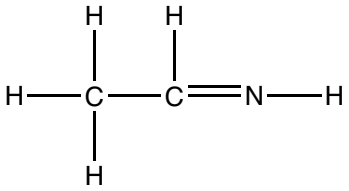
9. (12 pts.) For each of the following structures, circle the H that would more/most easily be removed by a base.

10. (10 pts.) Using wedge (◄) and dashed (┈┈) bonds where appropriate, draw 3-D representations of the following molecules. When drawing the 3-D representations draw all of the atoms. Lewis and Kekulé structures are provided.

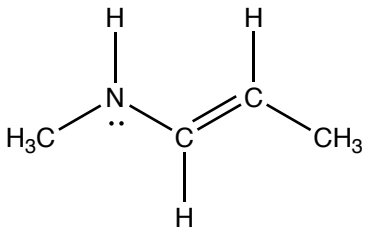
a.





11. (12 pts.) Draw resonance contributors for the following structures. Remember to determine and indicate any formal charges that may form.

a.



b.