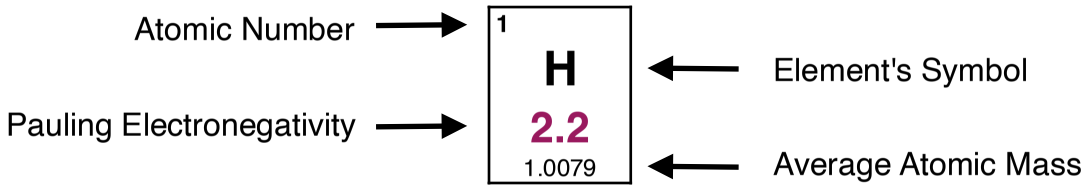
Some Electronegativities of Elements of Interest to Organic Chemists[1]

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 2 (10/29)
CHEM 0201 (Organic I) Fall 2025

1. _____

1. (12 pts.) Diethyl ether ($CH_3CH_2OCH_2CH_3$) is a larger molecule than ethanol (CH_3CH_2OH) but ethanol has the higher boiling point. Briefly explain why ethanol has a higher boiling point.

2. _____

3. _____

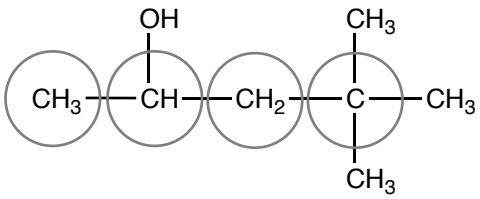
4. _____

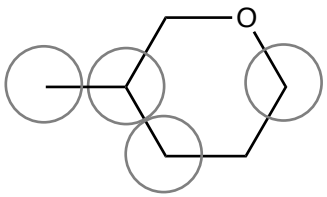
5. _____

6. _____

7. _____

2. (8 pts.) Determine the degree of substitution (methyl, 1°, 2°, 3°, or 4°) for the circled C atoms.





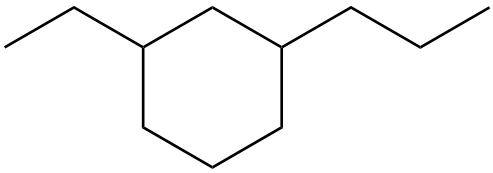
8. _____

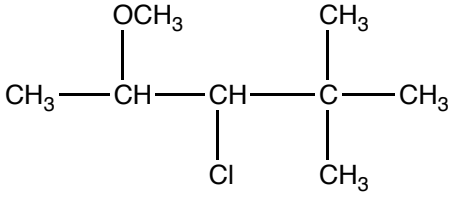
9. _____

10. _____

3. (16 pts.) Provide IUPAC names for the following molecules.

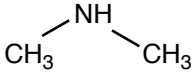
11. _____

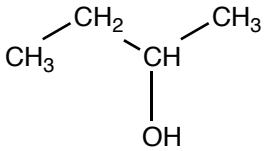


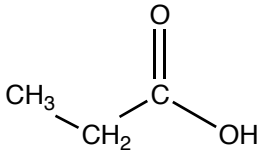


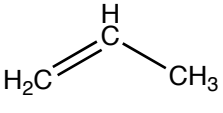
_____ _____

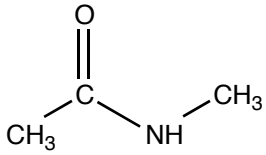
4. (10 pts.) Identify/name the functional groups in the following structures. (Remember, alkyl groups are not considered functional groups.)



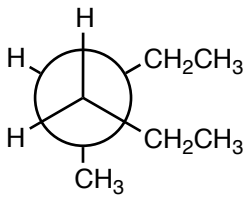




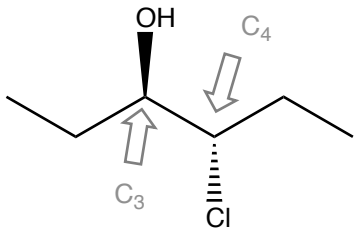




5. (**a. 4 pts.**) Circle any groups or atoms experiencing gauche interactions on the Newman projection drawn below. Draw Newman projections showing the (**b. 4 pts.**) lowest and (**c. 4 pts.**) the highest energy conformations of the view of the molecule drawn below.



6. (8 pts.) Draw a Newman projection along the C_3 to C_4 bond of the conformation of 4-chloro-3-pentanol drawn below.



7. While not being as reactive as cyclopropane, cyclobutane's C to C bonds are still far more reactive than typical C to C bonds in acyclic alkanes. (**a. 3 pts.**) Draw cyclobutane. (**b. 3 pts.**) Determine the hybridization of the C atoms in cyclobutane, (**c. 6 pts.**) briefly explain why these bonds are more reactive than typical C to C single bonds.

8. (10 pts.) Mark the following true of false.

_____ In a disubstituted cyclohexane, to convert a *cis* relationship to a *trans* relationship bonds would need to be broken.

_____ In a disubstituted cyclohexane, no bonds need to be broken to convert axial substituents to equatorial substituents.

9. (8 pts.) Draw the lowest energy conformation of a *trans*-1-ethyl-3-methylcyclohexane molecule.

10. (10 pts.) If all five carbon atoms in cyclopentane were coplanar, the C to C bond angles would be 108°. However, cyclopentane rings are not planar, and the C to C bond angles vary from 102 to 106°. Briefly explain why cyclopentane does not adopt a planar geometry.

10. Four pairs of substituted cyclohexane rings are drawn below.

a. (8 pts.) If the two structures in a given pair can be interconverted by a so-called ring flip write "yes" under the pair; if not write "no". When examining the structures you should assume that the molecules themselves have not been rotated in space.

b. (4 pts.)For each pair, circle the structure that would be lower in energy.