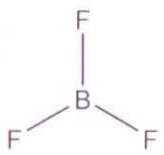
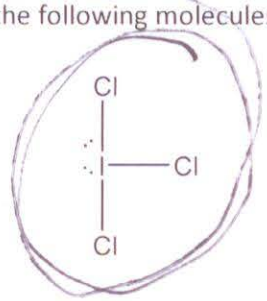
CHEM 105 – Dr. Lammi

Name: _____

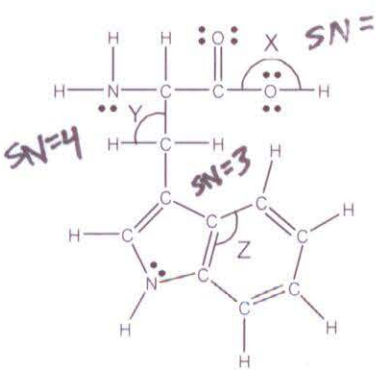
Quiz 4 – Oct. 2, 2019

1. (3 pts) Which of the following molecules is/are **polar**? **Circle all that apply**.





2. (10 pts) A **Lewis structure** for the amino acid tryptophan, $C_{11}H_{12}N_2O_2$, is shown below.



a. Please **estimate the bond angles** X, Y, and Z as accurately as possible. Write your answers on the blanks below.

Angle X: $<109.5^\circ$ **Angle Y:** 109.5° **Angle Z:** 120°

b. Please specify the **type of hybrid orbitals** used by the central atoms in Angles X and Z:

$O_{\text{Angle X}}$: sp^3 $C_{\text{Angle Z}}$: sp^2

3. (12 pts) Suppose that propane gas, C_3H_8, is completely combusted in air to form carbon dioxide and water.

a. **Write and balance** the chemical reaction describing this process.

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O$$

b. Suppose you want to calculate the mass of oxygen that is required to react with 500.0 g of propane. **Very briefly, explain the steps** you would take to do this. Be sure to specify all information that you would use or determine along the way. (**Note:** You should **not** do any actual calculations here.)

g C_3H_8 → mol C_3H_8 → mol O_2 → g O_2

molar mass C_3H_8 — coefficients — molar mass O_2

- Calculate molar masses (MM) of C_3H_8 and O_2
- Use MM of C_3H_8 to find moles C_3H_8
- Use mole-to-mole ratio (coeffs.) to find moles O_2.
- Use MM of O_2 to find mass of O_2.