Kasdi Merbah University, Ouargla
Faculty of Mathematics and Material Sciences
Department of Chemistry
Level: Second Year Chemistry
Course: Mineral Chemistry

The third series

Exercise 1:

- Explain why the NH_3 molecule has a dipole moment $\mu = 1.46$ D, while the NF_3 molecule has a dipole moment $\mu = 0.24$ D.
- Also, explain why the dipole moment of the BF_3 molecule is zero, whereas the NF_3 molecule has a dipole moment $\mu = 0.24$ D.

Exercise 2:

- Give the geometric representation according to VSEPR theory and the hybridization of the following compounds:

  $BeCl_2$, BF_3, SO_2, SO_3, H_2S, $SnCl_2$, NH_3, HCN, CO_2, NH_4^+, O_3, H_3O^+, NOCl, $COCl_2$, $AlCl_3$, SCl_2,

Explain the difference in the geometries of the following

BCl_3 NCl_3 $BrCl_3$

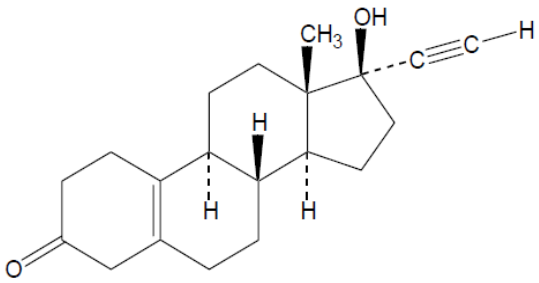
Exercise 3:

- What is the hybridization state of the underlined atoms in the following compounds:

  $\underline{C}O_2$, H$\underline{C}$N, O=$\underline{C}$Cl_2, CH_3-$\underline{C}H_2$-CH_3, O=$\underline{C}$=$\underline{C}H_2$-$\underline{C}H_3$

Exercise 4:

- For the following molecule , identify the following:



a) A highly polar covalent bond.

b) A nonpolar covalent bond.

c) An sp hybridized carbon atom.

d) An sp^2 hybridized carbon atom.

e) An sp^3 hybridized carbon atom.

f) A bond between two atoms with different hybridizations.

g) An sp^2 hybridized oxygen atom.

Exercise 5:

- The N_2F_2 molecule has a planar structure, with each fluorine atom bonded to a nitrogen atom.
    - Give the hybridization state of the nitrogen atoms.
    - Represent the orbitals in the molecule, and what is the expected bond angle?
    - If the dipole moment of the molecule is zero, determine the molecular geometry.

Exercise 6:

- Draw the molecular orbital (MO) diagrams for the following molecules:

  Li_2, Be_2, B_2, N_2, O_2, F_2, Ne_2, NO

- Which of the molecules are actually exist?
- Which molecule is the most stable?
- Determine the bond order and their magnetic properties
- Write the electronic configuration of (MO)for real molecules.