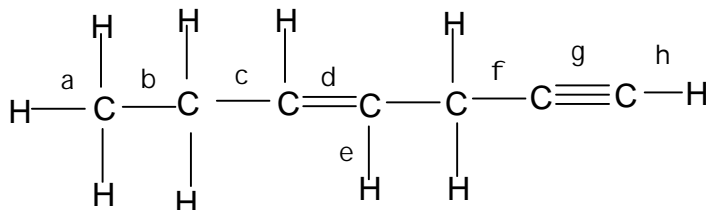


Assignment 5 Bonding

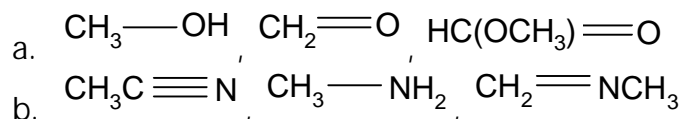
Lewis Structure, Resonance, Conjugation, Hybridization, Molecular Orbitals, Bond Energy, Bond length, Bond angle, Dipole moment.

1. Assign proper bond length's to the following bonds (a – h) by selecting values from the Pool

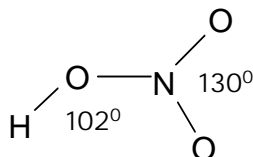


Pool : 1.06, 1.08, 1.10, 1.21, 1.34, 1.46, 1.50, 1.53 (all values in Angstroms)

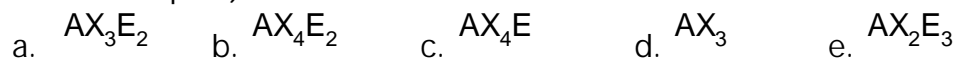
2. Within each of the following groups of compounds arrange according to increasing lengths of the indicated bonds.



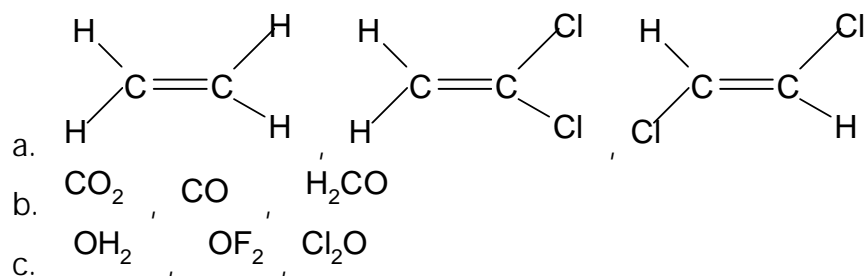
3. Explain the bond angles in



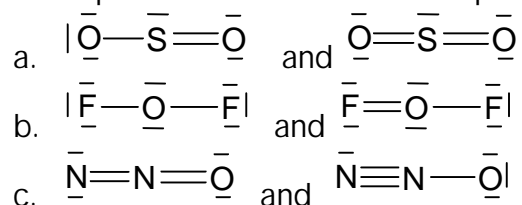
4. Classify the following molecules as polar or non polar (use VSEPR theory to determine shapes)



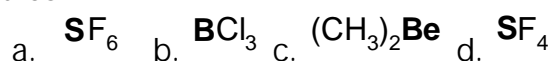
5. Arrange the molecules in the order of increasing dipole moments :



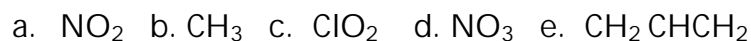
6. Given below are some resonance structures of a number of species. Determine the formal charge on each atom and then, if possible identify the more important of the structure pairs.



7. state the hybridization of the 'highlighted' atoms in the following molecules



8. Write down the lewis structure of the following odd electron species

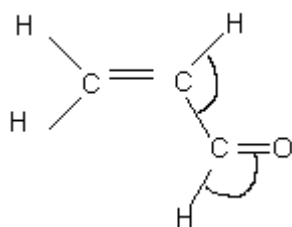


9. Explain why a) PF_5 and BrF_5 have different shapes. b) ClF_2^- and ClF_2 have different F - Cl - F bond angles ?

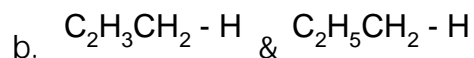
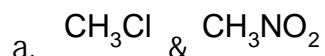
10. Write all the isoelectronic structures of CO_2 .

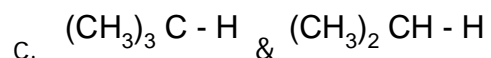
11. Write down the Lewis structure of all possible isomers of $\text{C}_7\text{H}_9\text{N}$, which contains a benzene ring.

12. Estimate the bond angles which are marked in the following molecule.

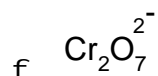
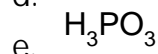
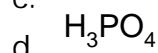
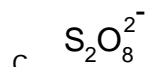
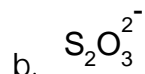


13. In each pair identify the one with a weaker C - H bond





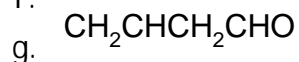
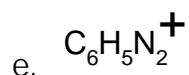
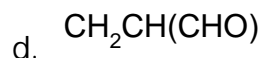
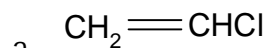
14. Write down the Lewis structures of



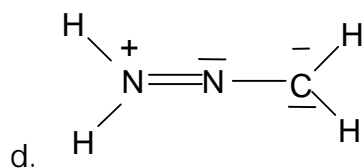
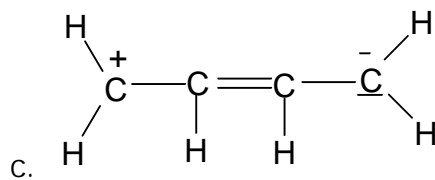
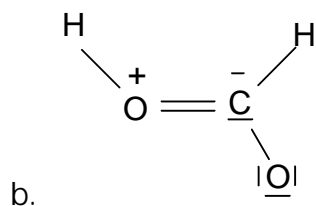
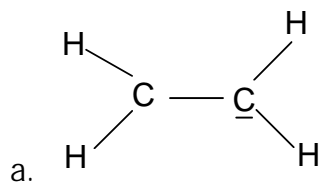
15. For each of the following species, draw MO diagrams to find out the bond order and the number of unpaired electrons: N_2 , H_2^- , B_2 , C_2^+ , O_2^{2-} and F_2^+ .

16. Assuming that the MO energy level diagrams for homonuclear and heteronuclear diatomic species are similar, draw MO diagrams to find out the bond order and the number of unpaired electrons for each of the following species: NO , NO^+ , CO , CN , CO^+ , CN^- , CN^+ , BN .

17. In each of the following cases write down the various contributing resonance structures



18. Keeping the same atomic connections and moving only electrons write a more stable Lewis structure for each of the following?



19. Show the C - N skeleton structure of dicyandiamide $\text{NCNC}(\text{NH}_2)_2$ and label the various bond angles, label also the σ & π bonds in the skeleton. And indicate each type of orbital overlaps which produce these bonds.

20. Replace the highlighted atoms with another atom to obtain corresponding isoelectronic species :

- $(\text{CH}_3)_3\text{CN}$
- BF_4^-
- $(\text{C}_2\text{H}_5)_3\text{N}$ (two answers)
- $\text{C}_2\text{H}_5\text{O}^-$ (two answers)
- $(\text{CH}_3)_2\text{O}$
- $\text{CH}_2=\text{NCH}_3$