AS A REMINDER:

Formal Charge

- Convention to keep track of charges
- \sum (sum of) of formal charges on all atoms in a molecule = overall charge on molecule

Rules for calculating formal charge

- Add number of protons in nucleus
- Subtract number of inner shell electrons
- Subtract number of unshared electrons
- Subtract ¹/₂ of the number of shared outer shell electrons

Examples:

1. Nitrite anion



Single bonded oxygen: +8 (number of protons) -2 (1s electrons) -6 (unshared electrons) $\frac{1}{2} \ge 2 = -1$ (1/2 of shared electrons) -1

Overall charge on the nitrite anion is = -1

2. Methyl anion



Overall charge on the methyl anion is = -1



3. Methyl radical

Overall charge on the methyl anion is = 0

4. Methyl cation

- (sp² hybridized carbon, planer shape)
- can be reactive intermediate in principle

Formal Charge on Carbon +6 (number of protons) -2 (1s electrons)

+6 (number of protons)

1 (unshared electrons)

 $\frac{1}{2} \ge 6 = -3 = -3 = (1/2 \text{ of shared electrons})$

-2 (1s electrons)

Formal Charge on Carbon

 $\frac{1}{2} \times 6 = \frac{-3}{-1} (1/2 \text{ of shared electrons})$

Overall charge on the methyl anion is = +1



DRAWING CHEMICAL STRUCTURES



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 γ -Hydroxybutyric acid

Open chain form

Bond line form

 $MF = C_4H_8O_3$

NB:The above compound can also be represented in the following forms, resulting from the free rotation of single bonds (sigma).

