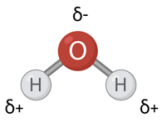
Electrophiles and Nucleophiles

Recall #1: Electrons are negatively charged and orbit the positively charged nucleus (which contains protons and neutrons).

Recall #2: Opposite charges attract, so electrons are attracted to positive species, and vice versa.

Nucleophiles ("Nucleus-loving"): Nucleophiles are electron-rich and are attracted to positively charged or electron-deficient species. They can be negatively charged or neutral with regions of partial negative charge.

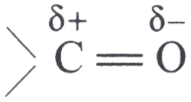
- Example: The oxygen in H_2O



- Although neutral overall, water is polar. Oxygen is more electronegative than hydrogen, so electrons spend more time around oxygen, making it partially negative.
- Conclusion: Oxygen acts as a nucleophile due to its high electron density and attraction to electron-poor species.

Electrophiles ("Electron-loving"): Electrophiles are electron-poor and seek out electrons. They can be positively charged or neutral with a partial positive charge.

- Example: Carbonyl in a Carbonyl Group (C=O)



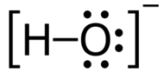
- Oxygen is more electronegative than carbon, pulling electron density away from carbon and making it partially positive.
- Conclusion: Carbon is an electrophile because it's electron-deficient and vulnerable to attack by nucleophiles.

Why This Matters: Recognizing electrophiles and nucleophiles is key to understanding how and why chemical reactions occur. Most organic reactions involve the movement of electrons, where nucleophiles donate electron pairs to electrophiles to form new bonds. This concept is foundational for predicting reaction mechanisms, understanding substitution, addition, and elimination reactions for the rest of this course.

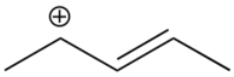
Let's Practice!

Classify the following as an electrophile or nucleophile:

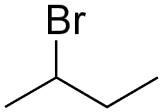
1. **Hydroxide Ion: ____**



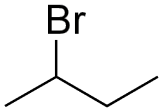
2. **Carbocation: ___**



3. **Carbon 2 in 2-bromobutane: ___**



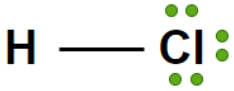
4. **Bromine in 2-bromobutane: ___**



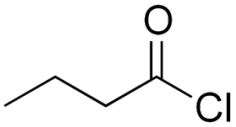
5. **The Pi bond in trans-2-butene: ___**



6. **The proton in hydrochloric acid: ___**



7. **Carbon 1 in butyryl chloride: ___**



8. **Ethoxide ion: ___**

