

The Visual Rule of Hydrogen Bonds

A hydrogen bond (---) is a weak attractive force between a highly electropositive hydrogen atom and a highly electronegative atom (F, O, or N).

INTERmolecular

Prefix: **Inter-** (Between)



Molecule A

Molecule B

Spans across multiple,
separate chemical entities.

INTRAmolecular

Prefix: **Intra-** (Within)



Trapped within a single,
continuous molecule.

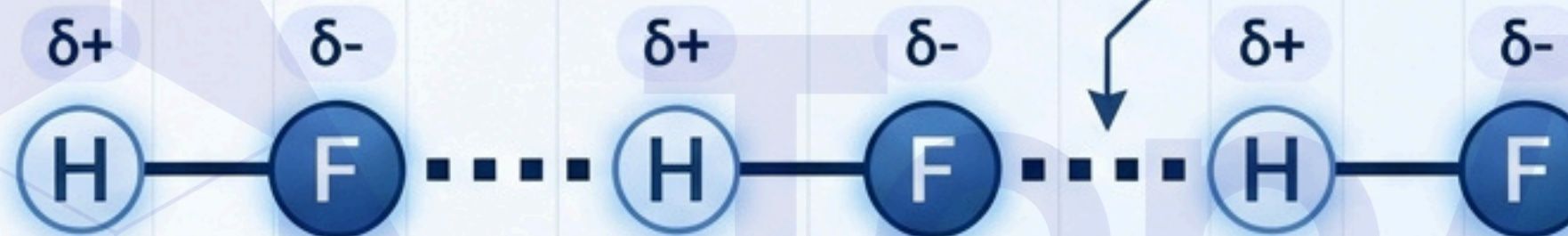
Design Note: Always represent Covalent bonds with a Solid Line (—) and Hydrogen bonds with a Dotted Line (---).

Intermolecular Hydrogen Bonds

Bridging separate molecules together to form larger chemical networks.

1 The Cause:

Fluorine (F) is highly electronegative, pulling the shared electron pair away from Hydrogen (H). This creates a polar molecule with partial fractional charges ($\delta+$, $\delta-$).



2 The Network:

The highly electropositive $\delta+$ Hydrogen of one molecule is attracted to the $\delta-$ Fluorine of another separate molecule.

Other Common Examples:

Water (H_2O) and Alcohols.

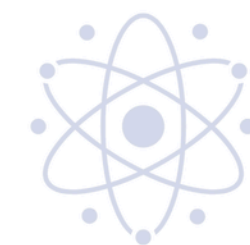
Macroscopic Effect:

These bridging networks strongly influence the physical state of the compound (maximum strength in solid state, minimum in gaseous state).



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$$E=mc^2$$



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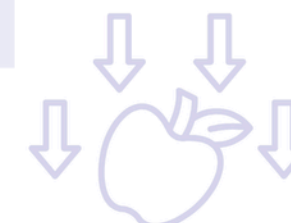
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Intramolecular Hydrogen Bonds

Internal stabilization within a single, flexible molecule.

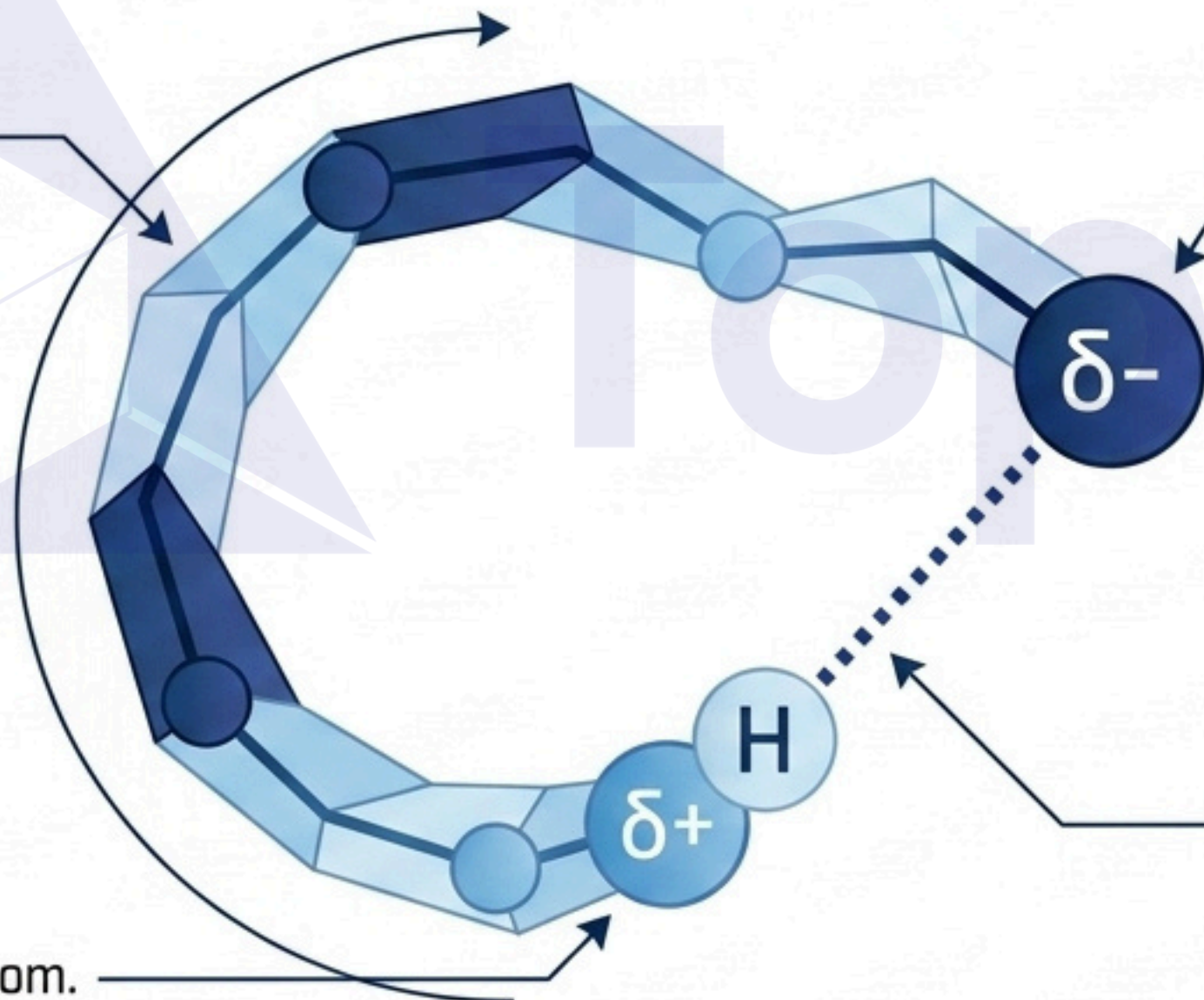
Formed when a hydrogen atom finds itself sandwiched between two highly electronegative atoms (F, O, or N) present within the same exact molecule.

Constraint 1: Must have a flexible enough structure to bend.

The Acceptor:
Highly electronegative atom.

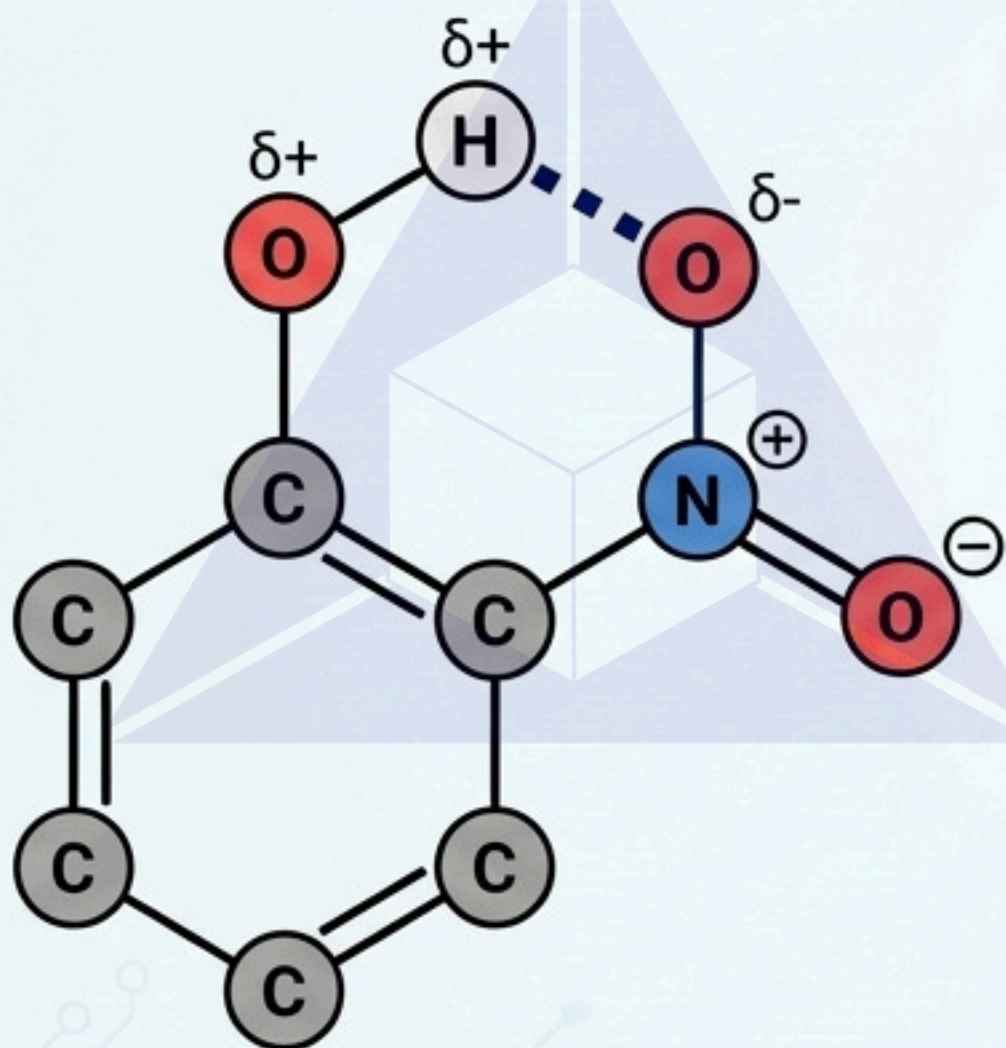
The Donor: Hydrogen atom.

The Result: Creates a temporary, stable ring-like structure, closing the loop internally.



Case Study: o-Nitrophenol

Seeing intramolecular forces in an organic compound.



1. The Setup

The hydroxyl (-OH) and nitro (-NO₂) groups are positioned directly adjacent to each other on the benzene ring (the ortho position).

2. The Trap

The Hydrogen atom from the -OH group is positioned perfectly in range of the highly electronegative Oxygen from the -NO₂ group.

3. The Bond

A localized hydrogen bond (- - -) forms within the molecule, completely independent of surrounding molecules, closing a 6-membered ring.

Revision Frame: Types of H-Bonds

Save this comparison matrix for your notes.



	Intermolecular H-Bond	Intramolecular H-Bond
The Core Rule	Forms between multiple, separate molecules.	Forms within a single molecule.
Visual Cue	Connects distinct chemical entities together.	Connects two parts of the exact same entity.
Textbook Examples	HF molecules, Water (H_2O), Alcohols.	o-Nitrophenol.
Structural Effect	Links molecules into physical networks (influences physical state).	Creates localized, stable ring-like structures internally.

Quick Reminder: Covalent bond = Solid Line (—). Hydrogen bond = Dotted Line (---). Both rely on highly electronegative elements (F, O, or N).



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