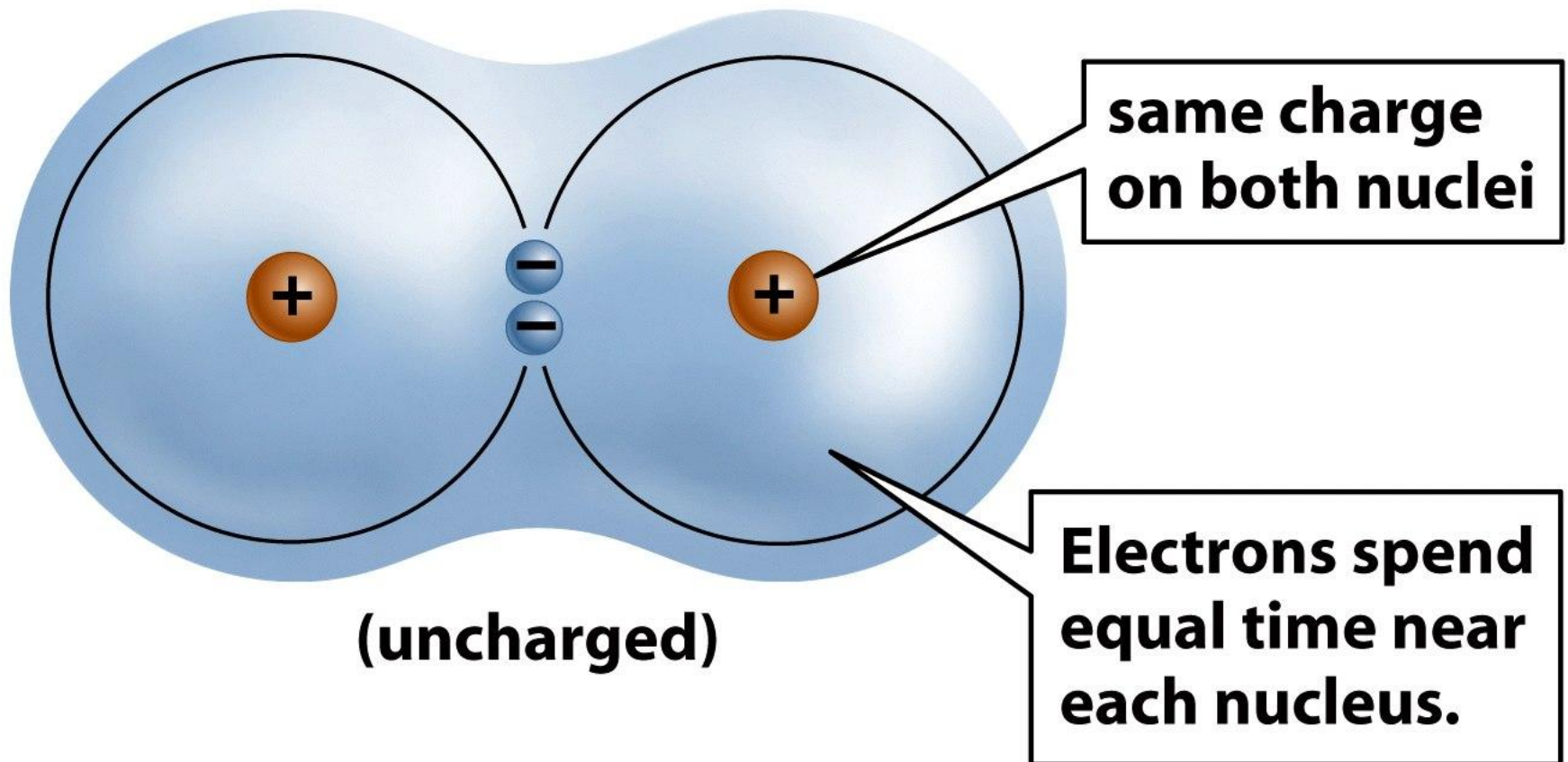


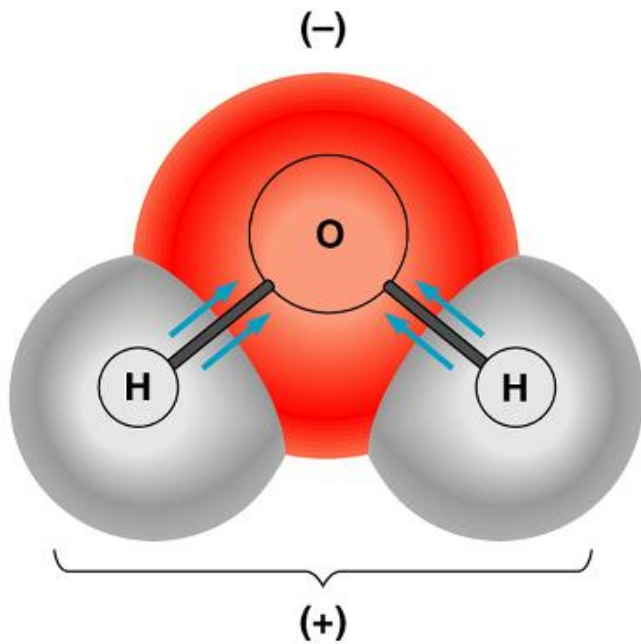
**Electrons in a covalent bond may be equally or unequally shared between the atoms**

- **Non-polar covalent bond:**  
atoms share electrons evenly

# Nonpolar covalent bonding

Hydrogen  
( $H_2$  or  $H-H$ )





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**Polar covalent bond:** atoms share electrons unequally, so there is a slight difference in charge between the two poles of the bond



# Polar Covalent Bonds

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- Those atoms with greater positive nuclear charge pull more strongly on electrons in a covalent bond

# Polar Covalent Bonds

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- A molecule with polar bonds may be polar overall
- $\text{H}_2\text{O}$  is a polar molecule
  - The (slightly) positively charged pole is around each hydrogen
  - The (slightly) negatively charged pole is around the oxygen

# Polar covalent bonding

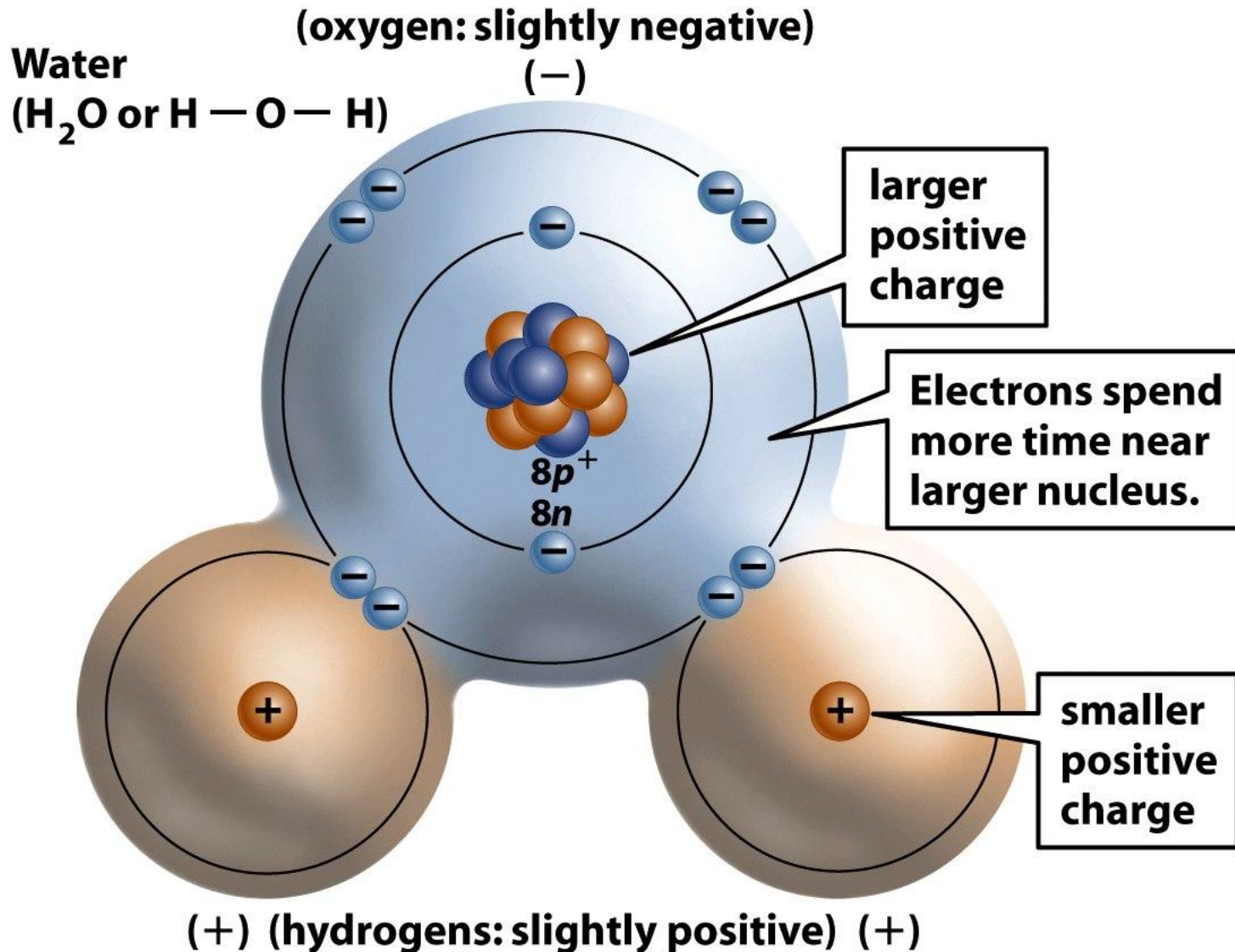


Figure 2-6b Biology: Life on Earth, 8/e  
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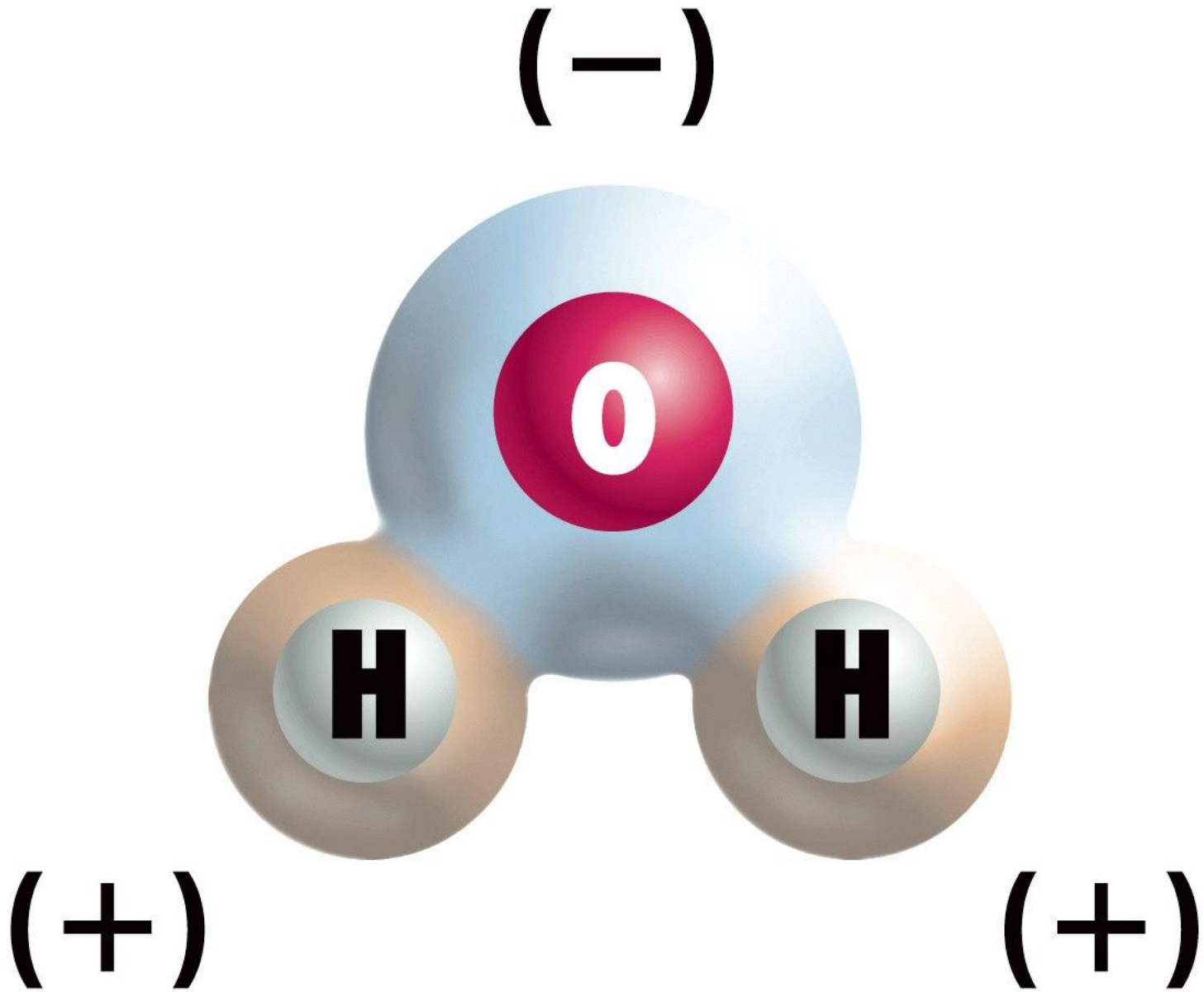
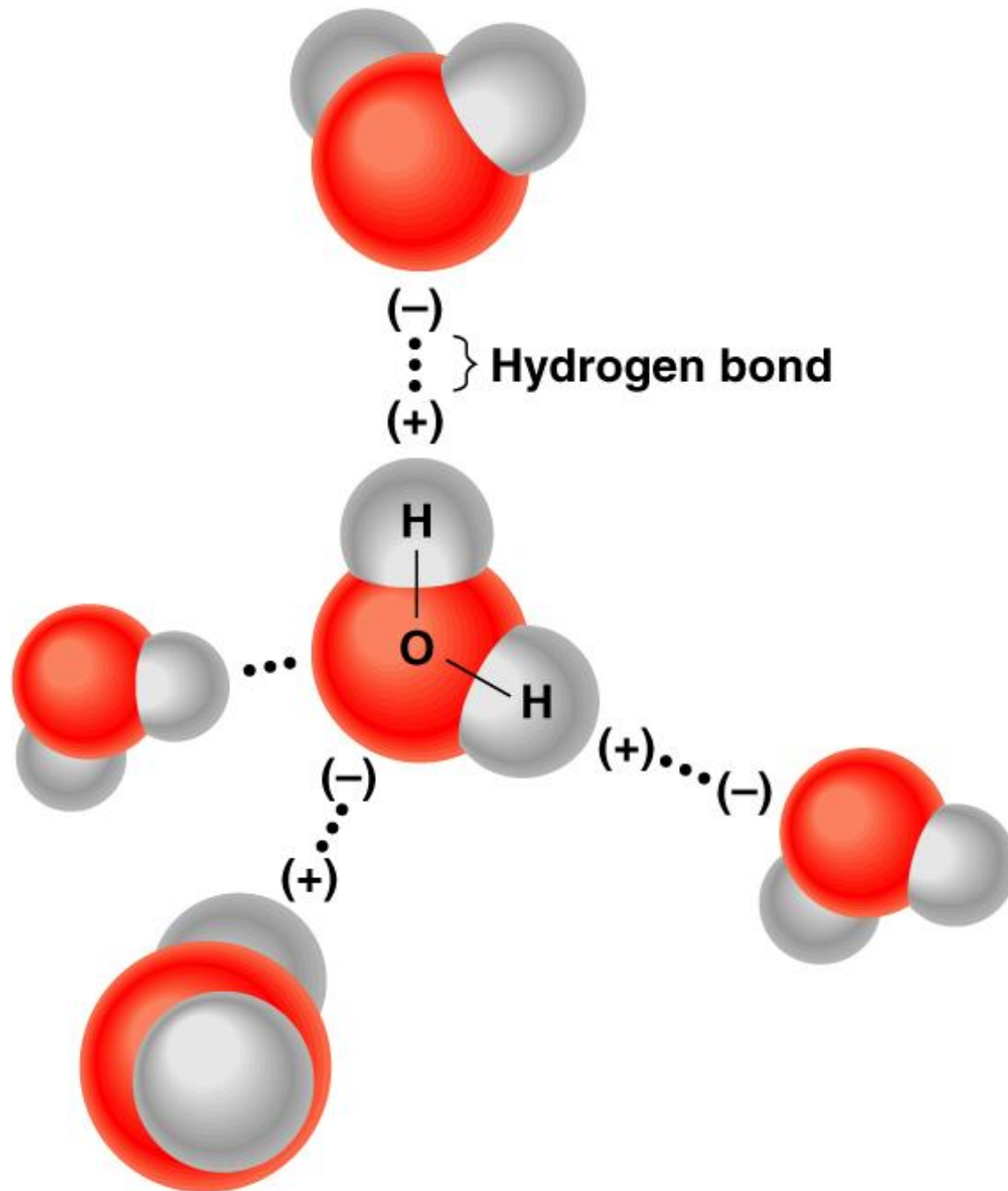


Figure 2-8 Biology: Life on Earth, 8/e  
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# Hydrogen Bonds

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- Polar molecules like water have partially charged atoms at their ends
- **Hydrogen bonds** form when partial opposite charges in different molecules attract each other
  - The partially positive hydrogens of one water molecule are attracted to the partially negative oxygen on another



# Hydrogen Bonds...

- Weak bond that is **easily broken** because no electrons are shared
- Important in stabilizing the **3D shape of large molecules** like proteins and DNA

# What is the difference between a nonpolar covalent bond and a polar covalent bond?

1. A polar covalent bond results when there is unequal sharing of electrons in a molecule, whereas electrons are shared equally in a nonpolar covalent bond.
2. A polar covalent bond has two equal sides and a nonpolar covalent bond has two different sides.
3. A nonpolar covalent bond is positively charged and a polar covalent bond is negatively charged.
4. A polar covalent bond is positively charged and a nonpolar covalent bond is negatively charged.

# What is the difference between a nonpolar covalent bond and a polar covalent bond?

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3. A nonpolar covalent bond is positively charged and a polar covalent bond is negatively charged.
4. A polar covalent bond is positively charged and a nonpolar covalent bond is negatively charged.

**Table 2-2 Common Types of Bonds in Biological Molecules**

Type	Interaction	Example
<b>Ionic bond</b>	An electron is transferred, creating positive and negative ions that attract one another.	Occurs between sodium ( $\text{Na}^+$ ) and chloride ( $\text{Cl}^-$ ) ions of table salt ( $\text{NaCl}$ )
<b>Covalent bond</b>	Electron pairs are shared.	
<i>Nonpolar</i>	Equal sharing	Occurs between the two oxygen atoms in oxygen gas ( $\text{O}_2$ )
<i>Polar</i>	Unequal sharing	Occurs between the hydrogen and oxygen atoms of a water molecule ( $\text{H}_2\text{O}$ )
<b>Hydrogen bond</b>	The slightly positive charge on a hydrogen atom involved in a polar covalent bond attracts the slightly negative charge on an oxygen or nitrogen atom involved in a polar covalent bond.	Occurs between water molecules; slightly positive charges on hydrogens attract slightly negative charges on oxygens in adjacent molecules