

Water, Water, Everywhere

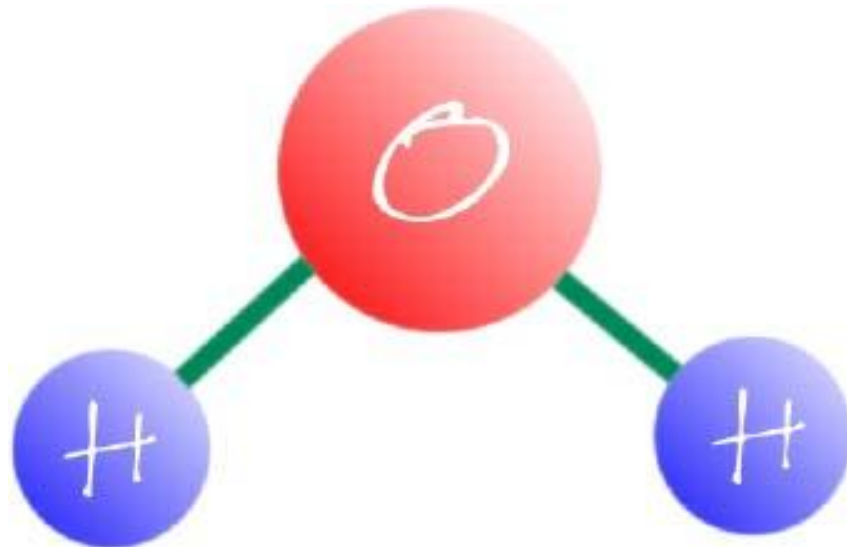


Water is important because:

- Most organisms have high water content (75 - 95%).
- Many organisms live in water.
- Most chemical reactions of life take place in water.

Water Structure

- A water molecule consists of 2 hydrogen and 1 oxygen atom, hence...H₂O.
- Electrons are *shared* through polar covalent bonding between the atoms.





BILL: explain the tug of war analogy for the polar covalent bond.

What was represented by the people? By the rope? How is this like the bond?



8 protons of oxygen atom
pull harder on the electron



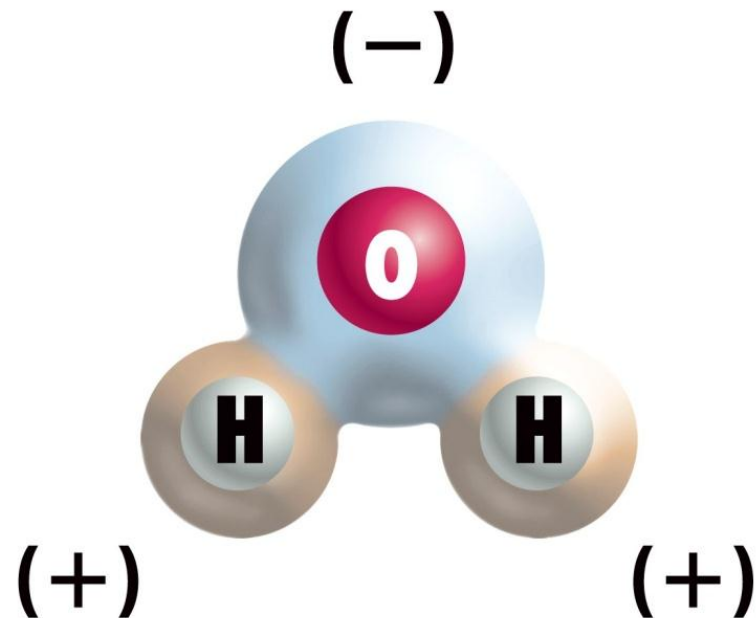
An electron being
shared between
O and H



1 proton of hydrogen atom
pull less hard on the electron

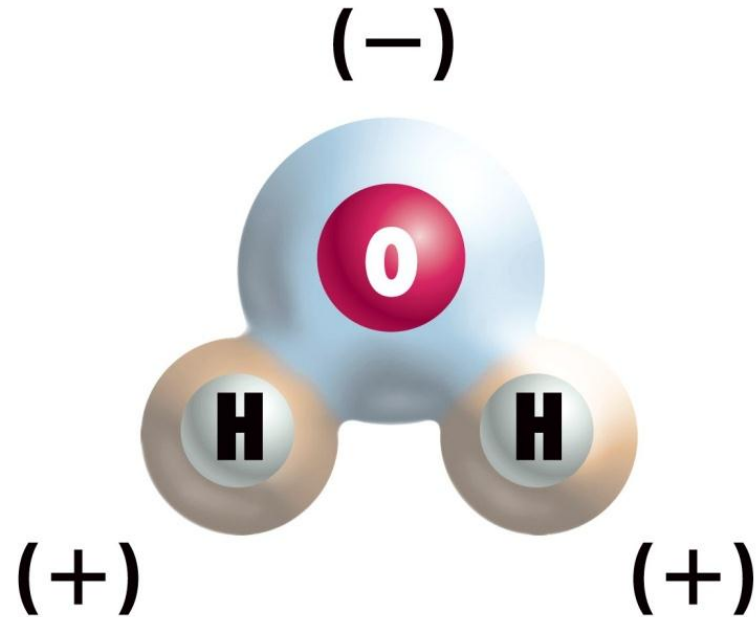
Water molecules are polar

- The e are shared unequally, creating an unequal distribution of charge.
- The oxygen atom has more protons so it attracts the shared electrons more of the time



Water molecules are polar

- The e are shared unequally, creating an unequal distribution of charge.
- The oxygen atom has more protons so it attracts the shared electrons more of the time
- Results in:
 - The hydrogen's have a partial positive charge
 - The oxygen has a partial negative charge



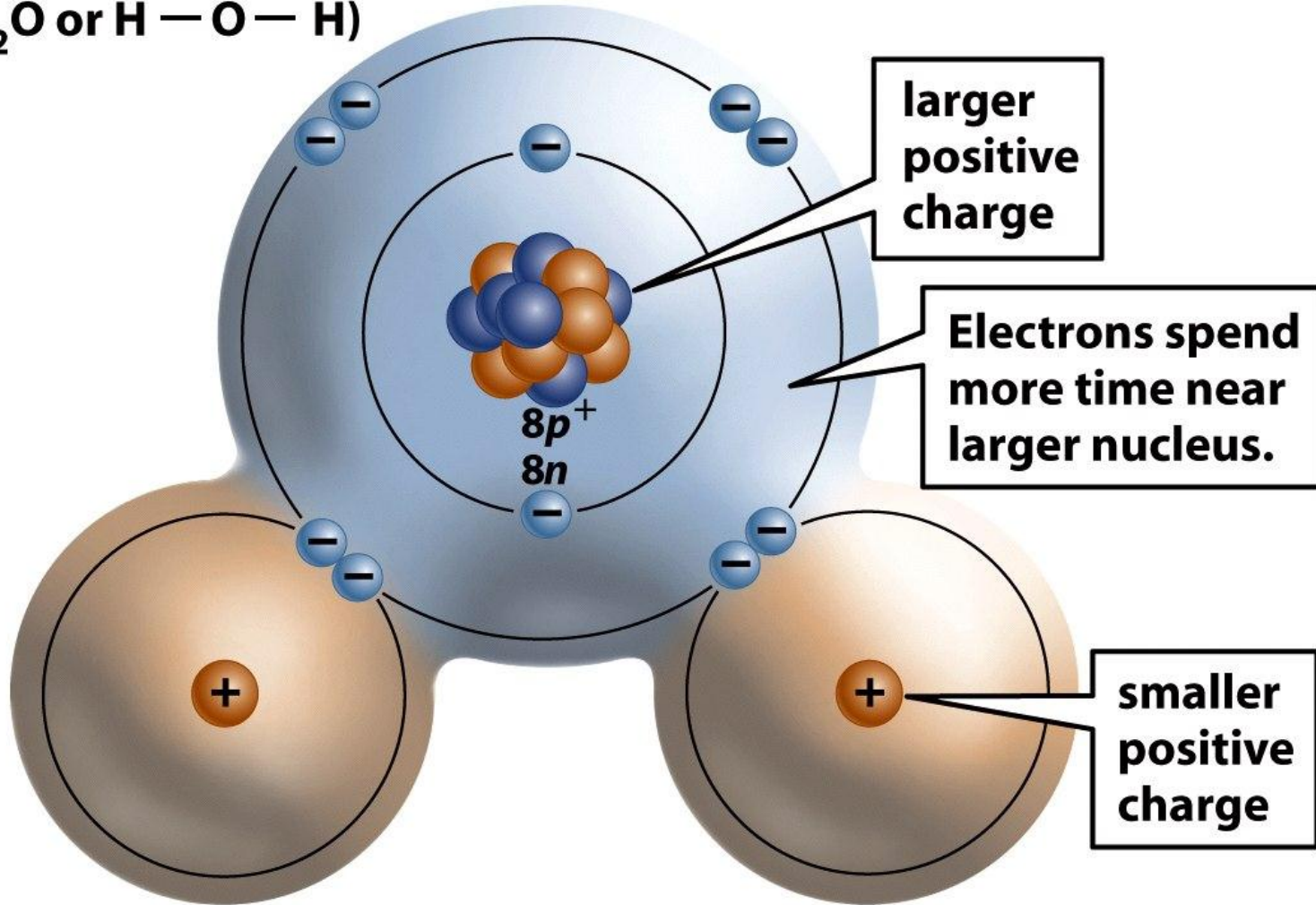
Polar covalent bonding

Water

(H_2O or $H - O - H$)

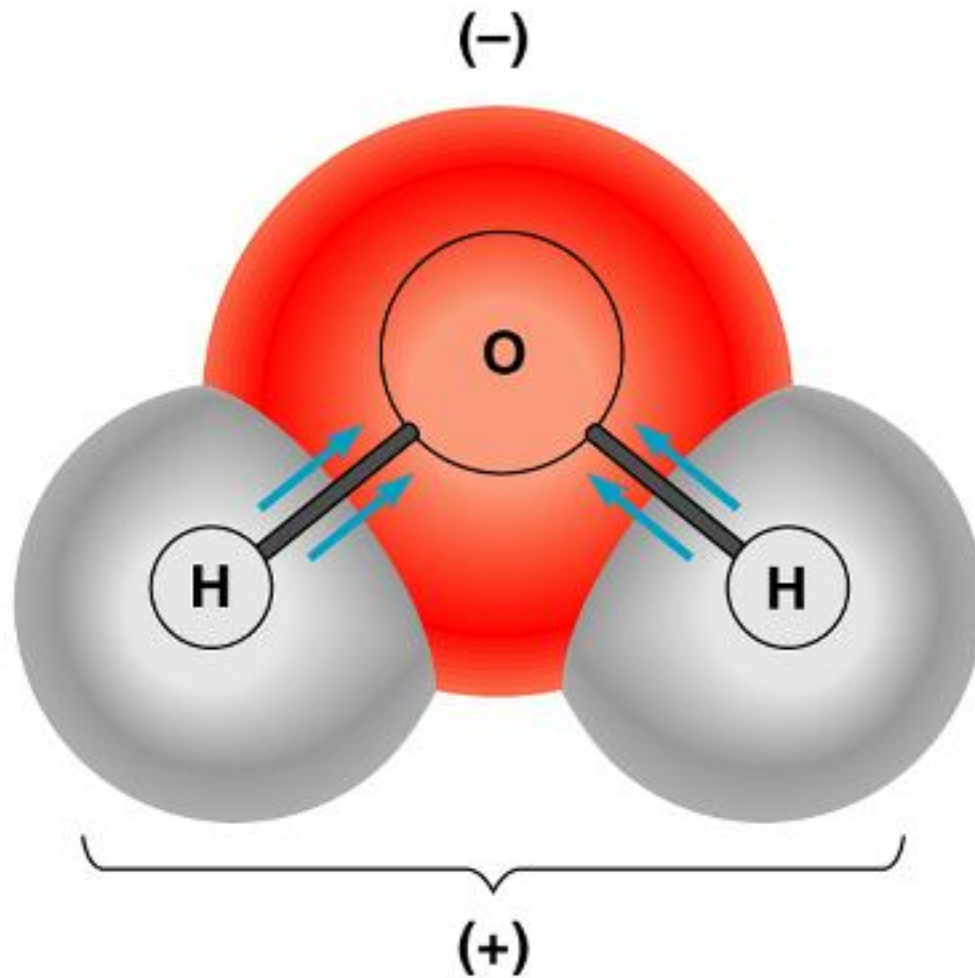
(oxygen: slightly negative)

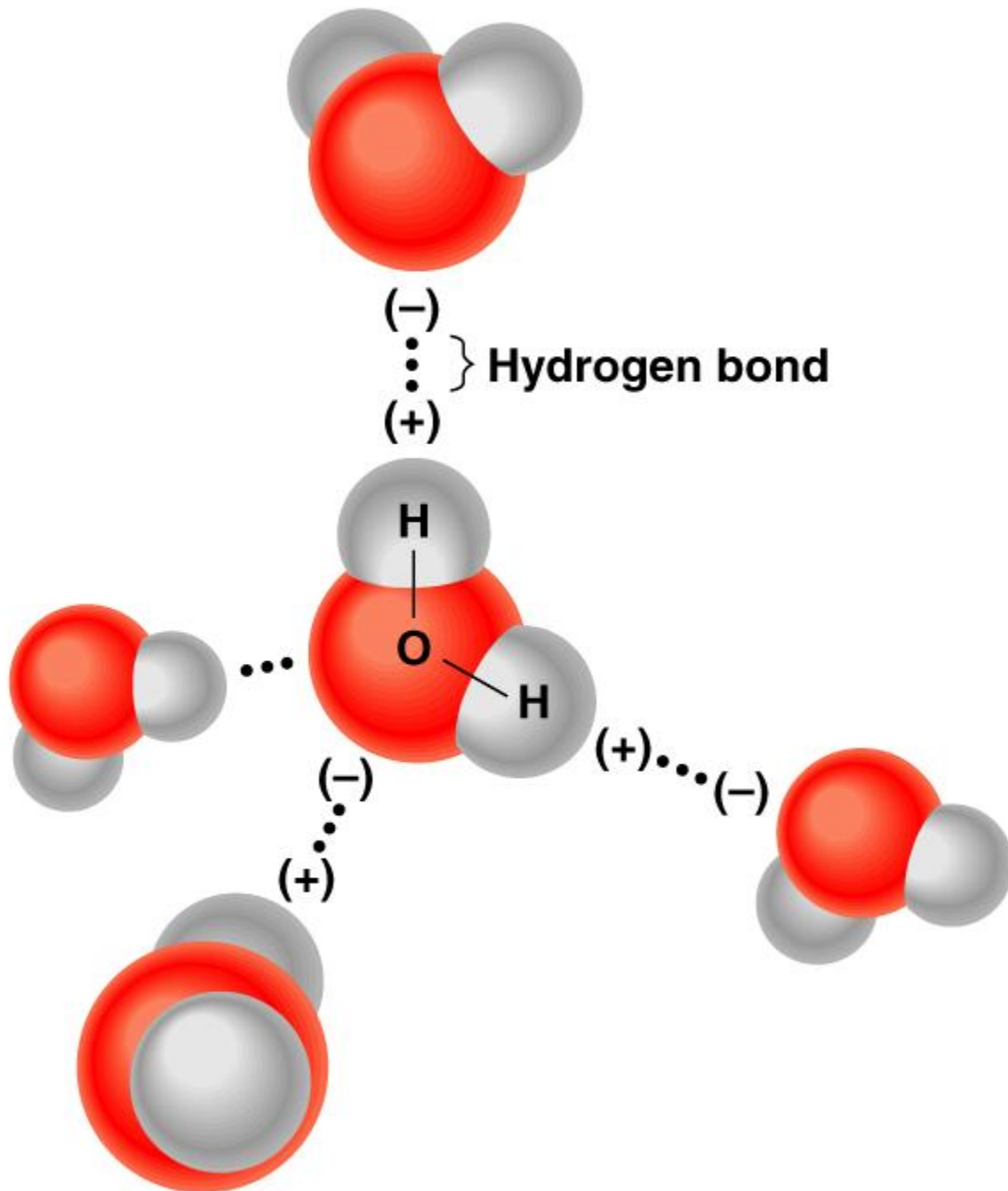
(-)



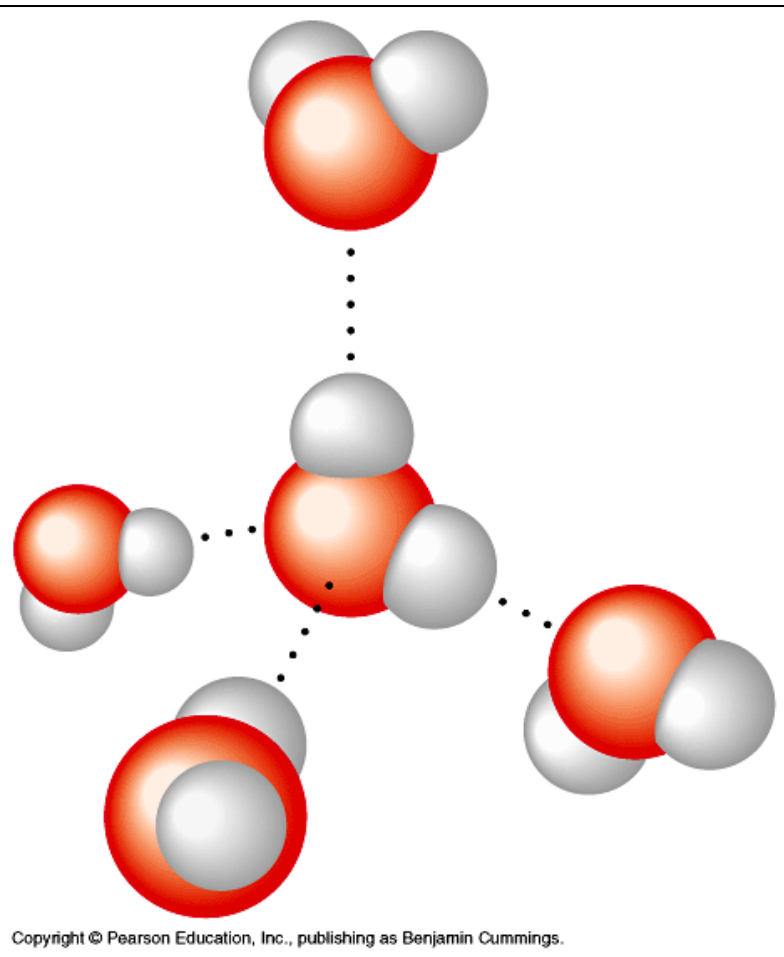
(+) (hydrogens: slightly positive) (+)

BILL: Draw a water molecule showing the polarity of the molecule.



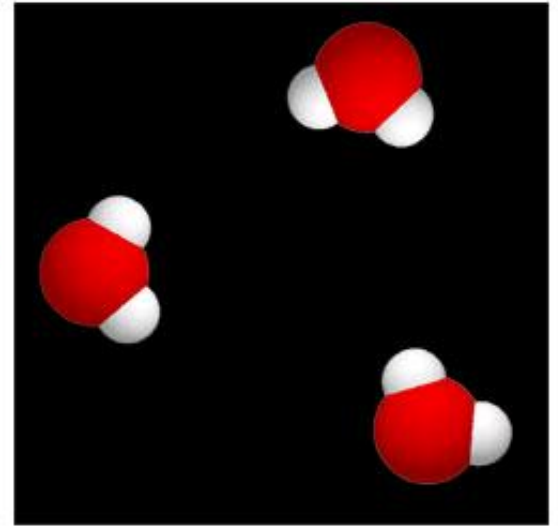
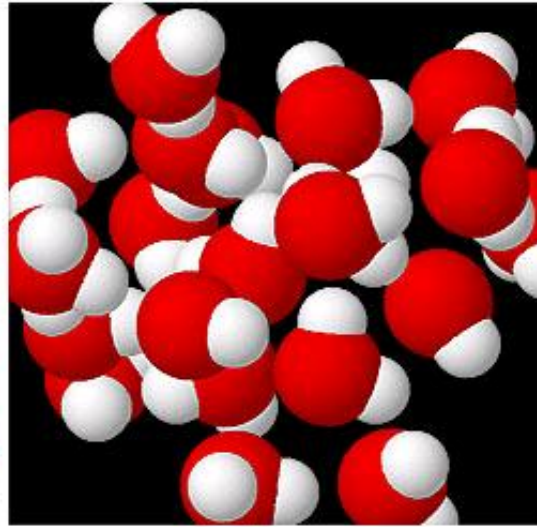
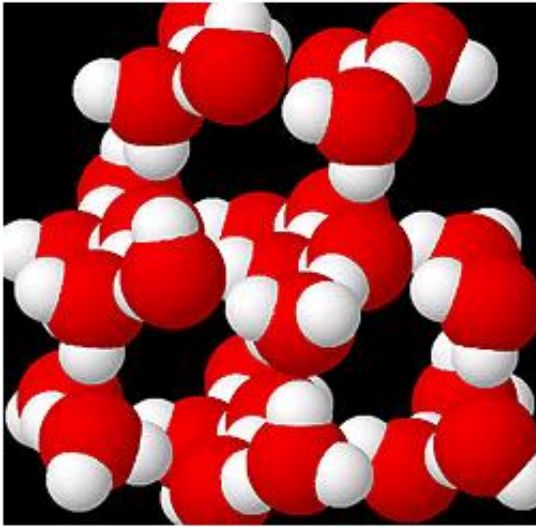


Water molecules can form **hydrogen bonds**



- Partly positive hydrogen atoms of one water molecule are attracted to the partially negative oxygen atom of another water molecule
- The bonds are made and broken quickly as the molecules move, however the large numbers of bonds contribute to the stability of water

The Three Phases of Water



Benjamin
Cummings