

Key Teaching Points for the Water Kit®

Overall Student Learning Objective: What Dictates How a Protein Will Fold?

- Proteins fold in water.
- Water's polar nature allows for interactions with other molecules.
- Water dissolves salt and may interact with other charged ions.
- Some substances do not interact with water and are considered to be hydrophobic.

★ For a more complete lesson guide, please visit:
<http://www.3dmoleculardesigns.com/Education-Products/Water-Kit.htm>

Properties of Water

Pour the contents of the water cup out.

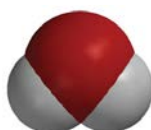
Identify the models representing the water molecules. Explore the interaction between these water molecules.

1. Identify the atoms comprising the water molecule shown to the right.



Electrons are asymmetrically distributed around the water molecule.

2. Indicate the polarity of the water molecule shown to the right.

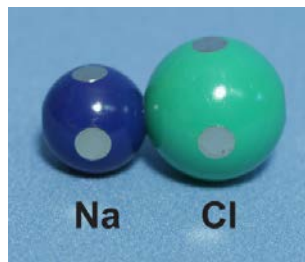


3. Which parts of the water molecules “stick” to other water molecules?
4. Make a sketch illustrating the intermolecular force that holds five water molecules together.
5. Label the hydrogen bonds in your illustration above.
6. What is the intra-molecular bond that holds the hydrogen atoms and the oxygen atom together in a water molecule?

Salt (sodium chloride - NaCl):

Remove the blue sodium ion and the green chloride ion from the water cup. Note that these ions are attracted to each other.

7. Why do the sodium and chloride ions come together?
8. Describe or illustrate how water interacts with the salt molecule.



Ethane (C₂H₆):

Remove the gray and white ethane molecule from the water cup.

9. Sketch and label the molecular structure of ethane.
10. What happens when the water and ethane are mixed?



Electrons are symmetrically distributed around the carbon atoms. Ethane is considered to be nonpolar and **hydrophobic**.

If a hydroxide group is added to the ethane molecule, the new molecule (ethanol) is now able to interact with water.

Pull off the hydrogen marked with an arrow on the ethane and replace it with a hydroxyl (OH) group.

11. Sketch and label the molecular structure of ethanol.
12. How does ethanol and water interact?
13. Will ethanol molecules interact with each other? Why?

Ethanol interacts with water and is considered to be polar and **hydrophilic**.