

Topic 8: Water & Solutions

1. Water has some unusual properties.

- ✓ The bonds between H and O inside a water molecule are "polar covalent."
- ✓ Due to its structure, it is a polar molecule. This means it has an uneven distribution of electrons in it. The O end is (-) and the H ends are (+).
- ✓ Draw its Lewis dot structure here! _____
- ✓ Water is actually a VERY polar substance. As a result, it uses the very strong type of intermolecular (between molecule) forces of attraction called "HYDROGEN BONDS."
- ✓ As a result of H-bonding, water has an unusually high melting point and boiling point compared with similar molecules like H₂S.
- ✓ Water has a very high specific heat, so it heats up and cools down much more slowly than most materials. This value is found on Table B.
- ✓ Water solutions that contain ions are capable of conducting electricity. The substances that form the ions in solution are called "electrolytes."

2. Water is able to make solutions with many substances.

- ✓ Solutions are ALWAYS HOMOGENEOUS MIXTURES.
- ✓ Water will dissolve many ionic compounds.
- ✓ Water will dissolve molecular substances if they are also polar.
- ✓ This reminds us of the "like dissolves like" principle.
- ✓ Acids dissolve in water to form H⁺ ions. (This includes organic acids: R-COOH)
- ✓ Bases dissolve in water to form OH⁻ ions. (This does NOT include alcohols: R-OH)

3. Ionic compounds may be either soluble or insoluble in water.

- ✓ Use Table F to decide!

4. Solubility describes how much of a particular solute will dissolve in a set amount of water at a certain temperature.

- ✓ Use Table G. The amount of water used is 100 g.
- ✓ Saturated solutions hold all the solute possible at the temperature chosen for the water.
- ✓ An increase in temperature of the water usually makes it capable of dissolving more solute. The opposite is true for gas solutes like O₂ gas, or NH₃ or SO₂ or HCl.
- ✓ An increase in pressure over the solution increases the solubility of gas solutes. It does not affect solubility of solutes that are liquids or solids.

5. Solutions have a lower freezing point and a higher boiling point than pure water. This effect becomes larger with more concentrated solutions.

6. "Concentration" describes how much solute is dissolved in a certain amount of water.

- ✓ You should know how to calculate:
 - Molarity
 - % mass
 - Parts per million
- Use Table T and "plug and chug."