Rvsd 20 January 2016, 18May2016
Campbell 6th: 41-50, 7th: 41-56, Sadava 8th: 28-36, Campbell 10th: 37, 44-53

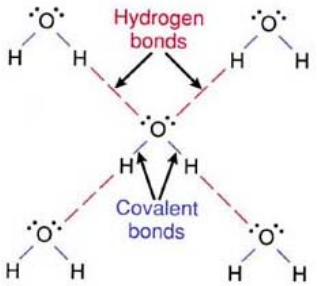
WATER: [Take the two tetrahedron models of water and four balloons tied together.)]
"*Sine qua non*." for life.

sp^3 hybrid orbital = tetrahedron (**valence shell repulsion theory**, **LEARN**) p 39
regular solids with animation: https://en.wikipedia.org/wiki/Platonic_solid [tetra-, hexa- (cube), octa-, dodeca- icosa-]

electronegativity of O (3.5) and H (2.1) has a difference of 1.4 = **polar covalent bond**.
Oxygen attracts electrons more strongly than H. (p 27 + 31)(Oxygen ("acid creator"): "hogs the electrons."

NOTE: charge separation generates **hydrogen bonds** (p 45)

makes water	→	**polar**	δ+ is attracted to δ- (δ = partial charge difference)
therefore	→	**cohesive**: (together cling)	high surface tension, capillary action (adhesion)
causing	→	**colligative properties**	1) Elevated boiling point (compare CO_2: -78°C)
		(together, tie)	2) High specific heat (1 cal = heat to raise 1 g H_2O 1 degree C)
		(**LEARN** these)	3) High heat of vaporization (580 cal/gm)
			4) Freezing point depression



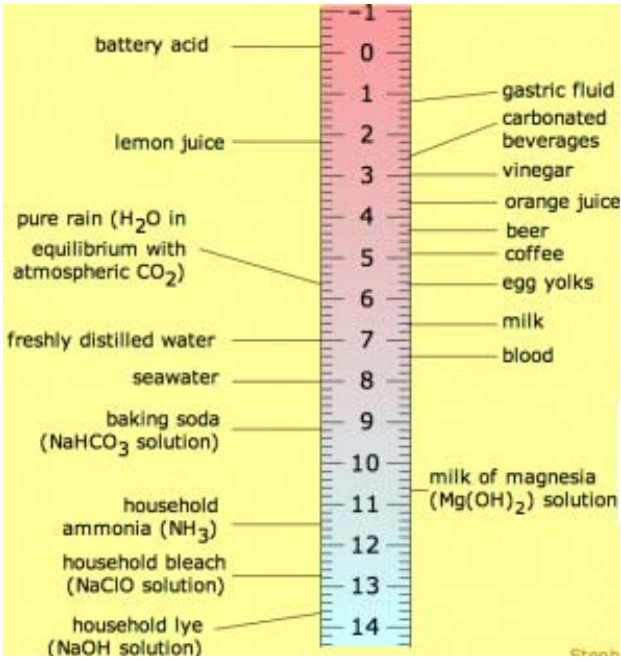
charged (ionic) and polar molecules are attracted to water: ∴ **H_2O = "universal solvent"**
hydrophilic vs hydrophobic (p 49) LEARN
solute, solvent, solutions (sol- dissolve, loosen) (p 48) LEARN

Rarely, the hydrogen nucleus can be induced to leave the water molecule, leaving OH^- (p. 51) This creates an ion pair. A hydronium and a hydroxyl. The process is called **ionization**.:
$2H_2O \leftrightharpoons H_3O^+ + OH^-$ (sometimes drawn $H_2O \leftrightharpoons H^+ + OH^-$) (LEARN) (p 51)

substance	**g H^+/liter $[H^+]$**	**exponential notation**	**logarithm to base 10**	**pH = $-\log_{10}[H^+]$**
gastric secretions	0.01	10^{-2}	-2	2
freshly distilled water	0.0000001	10^{-7}	-7	7
lye solution (NaOH)	0.00000000000001	10^{-13}	-13	13

Concentration of $H^+ = [H^+]$. Need shorthand for $[H^+]$:

Logarithm: power to which a base number must be raised in order to equal a given number. Negative $\log_{10}$ = "*p*"
***learn*: pH = $-\log_{10}[H^+]$** (LEARN well)
pH of household items: p 52



acids, bases. Buffers: (Show two cylinders, 1st small, connected to a large 2nd reservoir, stabilizes level of first.)
Acid = any compound that increases $[H^+]$ (LEARN)

oxygen ("acid, gives rise to")combines with elements.
Oxides dissolved in water make acids, ∴ "acid former" (p 53)
$CO_2 + H_2O \leftrightharpoons H_2CO_3$ (carbonic acid, ionizes: $H^+ + HCO_3^-$)
Blood pH: 7.35-7.45 critical. (HCO_3^- buffer in blood)
low blood pH: acidosis, causes hyperventilation (p 53)

acid rain (NO_x, SO_2, CO_3, PO_4), pH below 5.6: (LEARN)
early melt is especially acidic: can be pH 3 (Rain pH: p 1260)