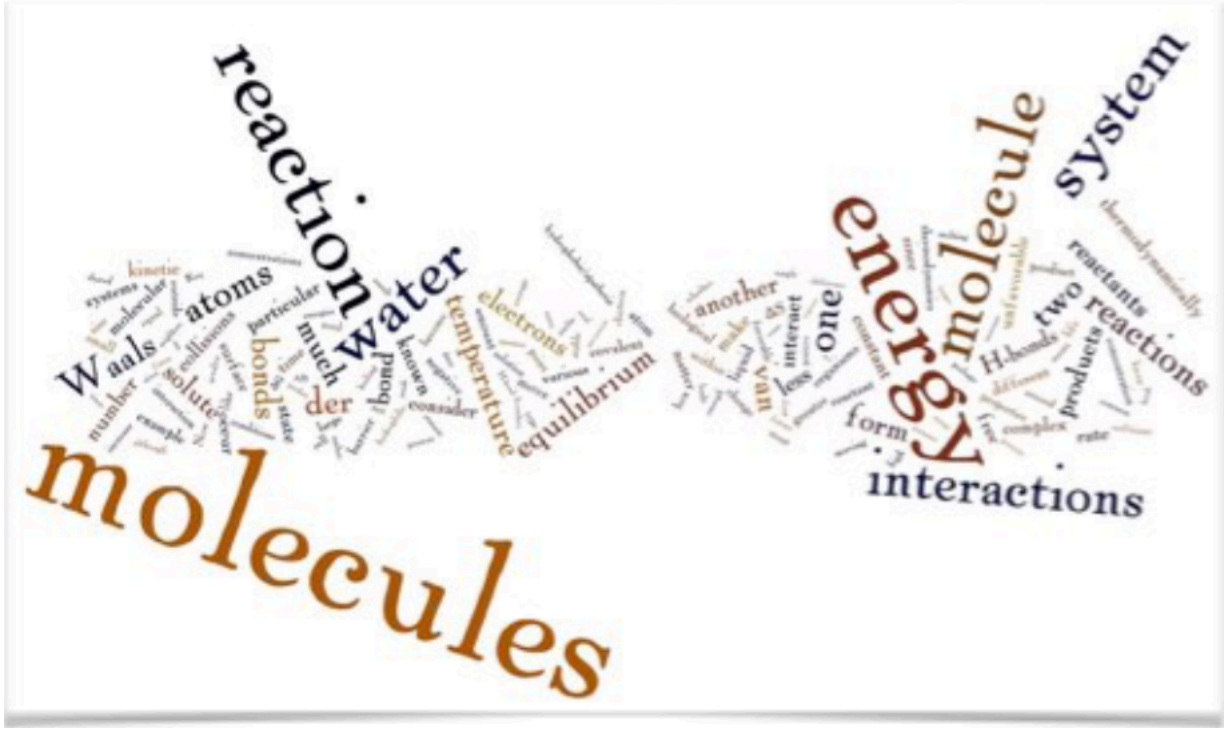
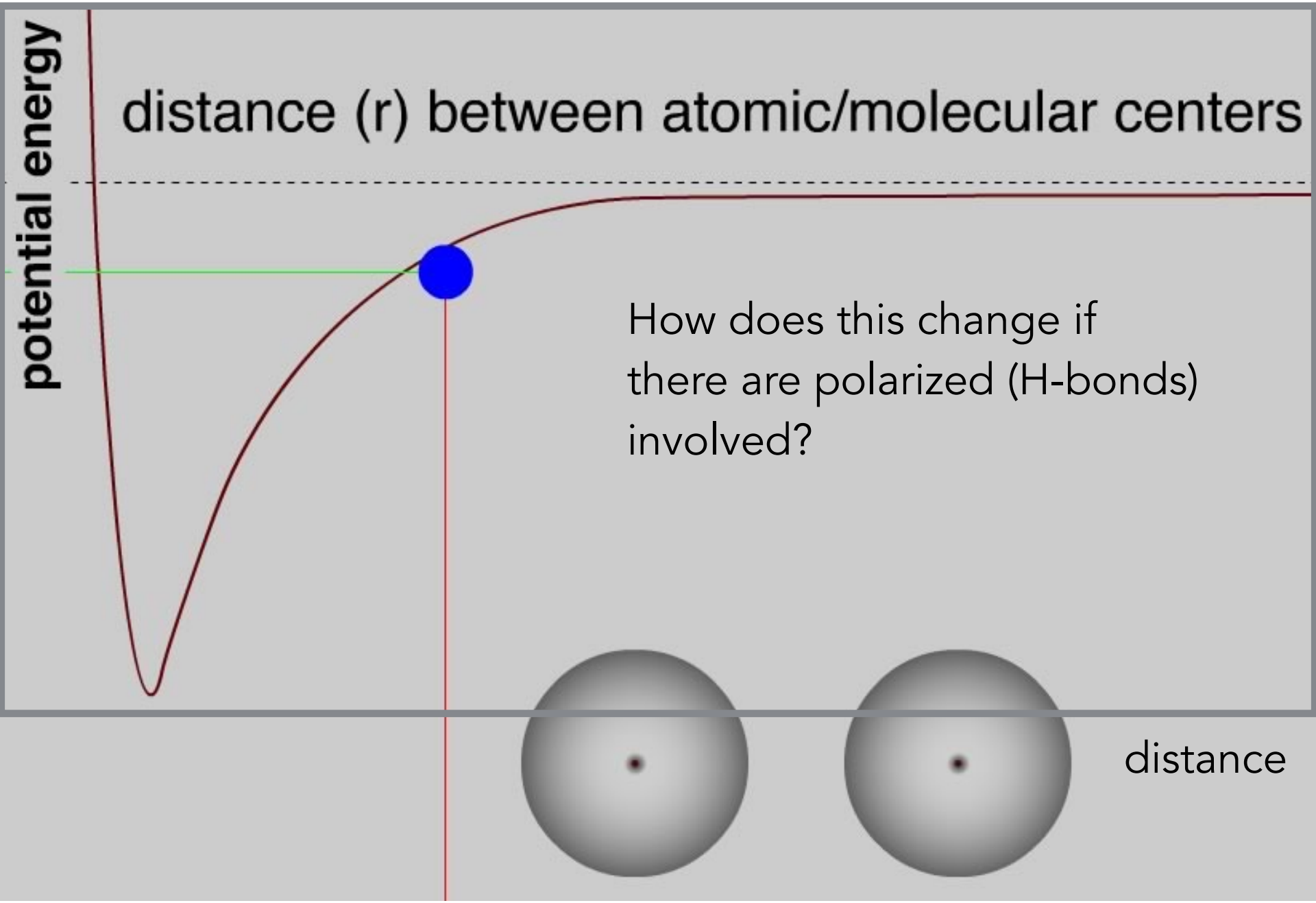
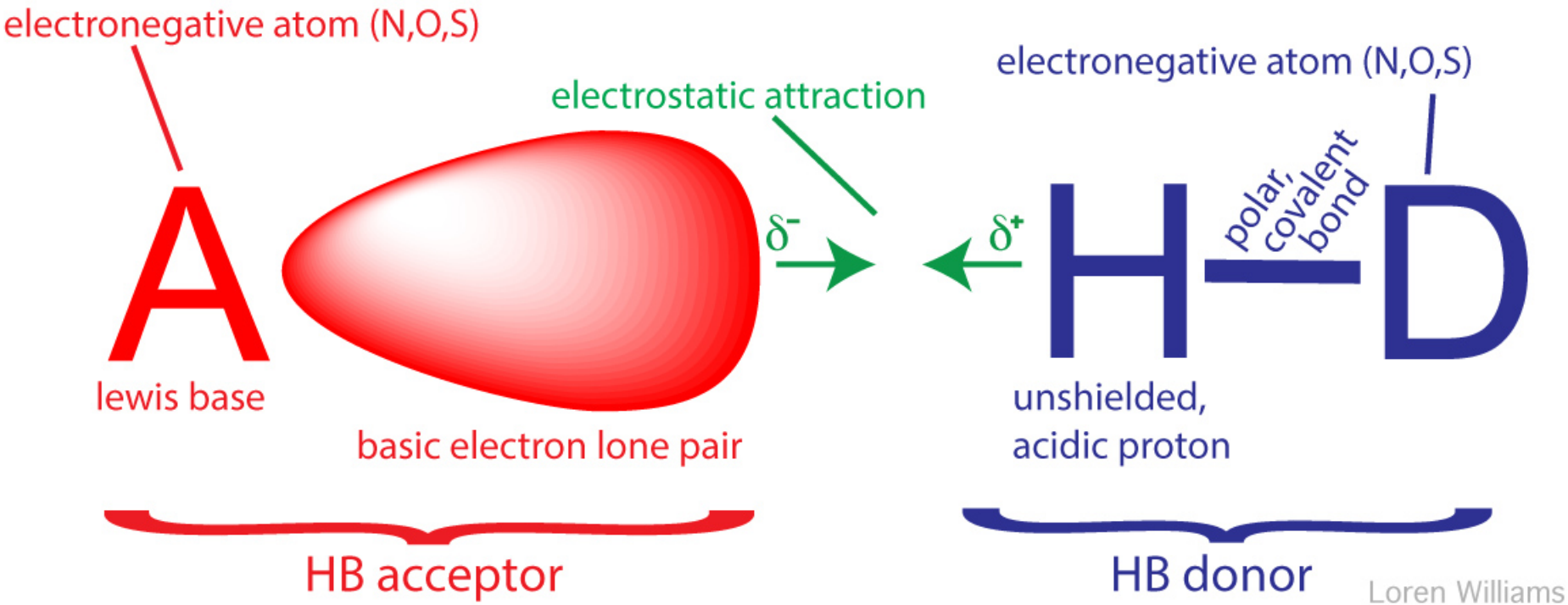


Questions: intra- and inter-molecular interactions

<u>course web site</u>

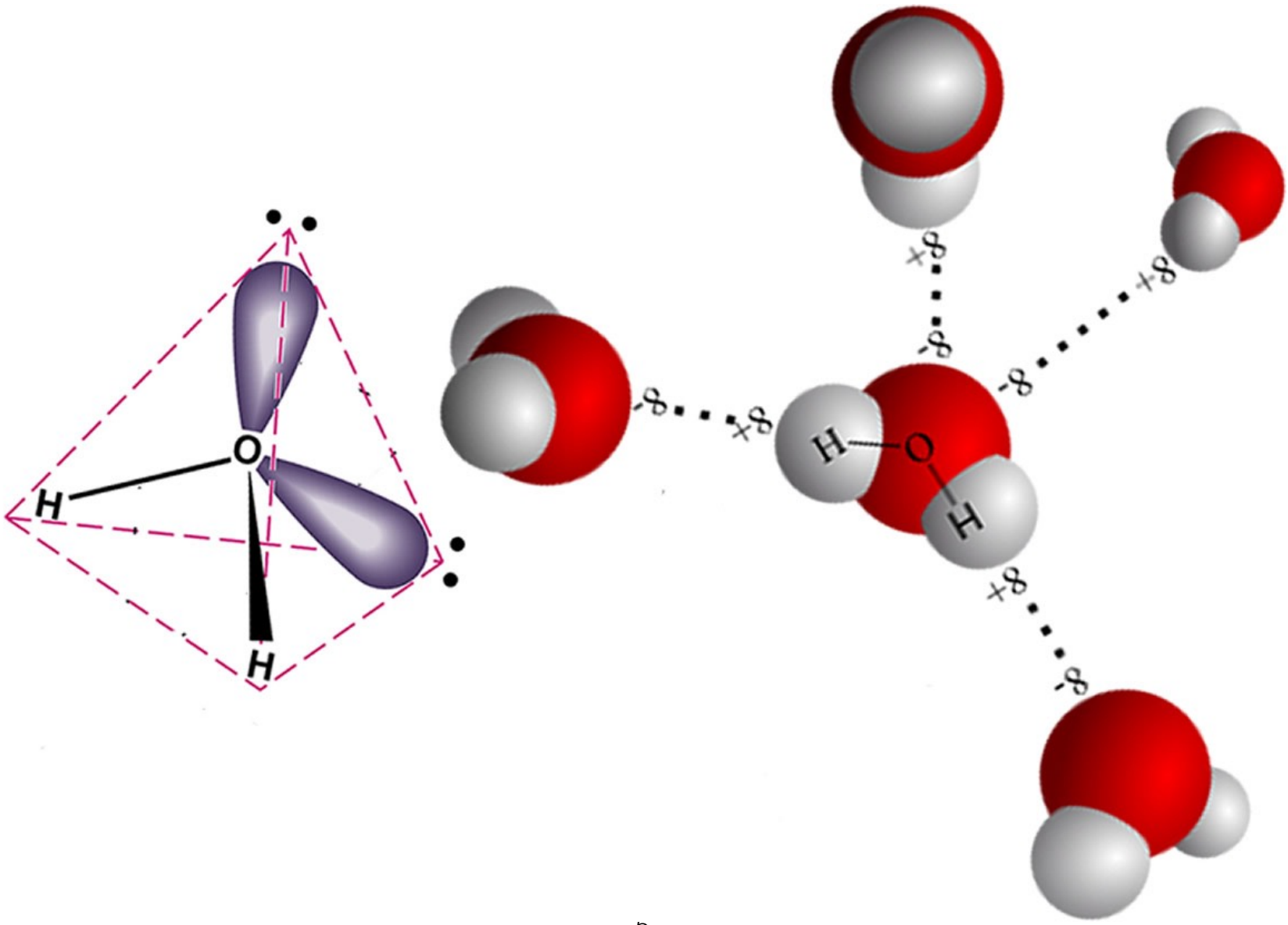

potential energy
distance (r) between atomic/molecular centers
How does this change if there are polarized (H-bonds) involved?
distance

Anatomy of a Hydrogen Bond



for drawing

How do water molecules interact with one another?

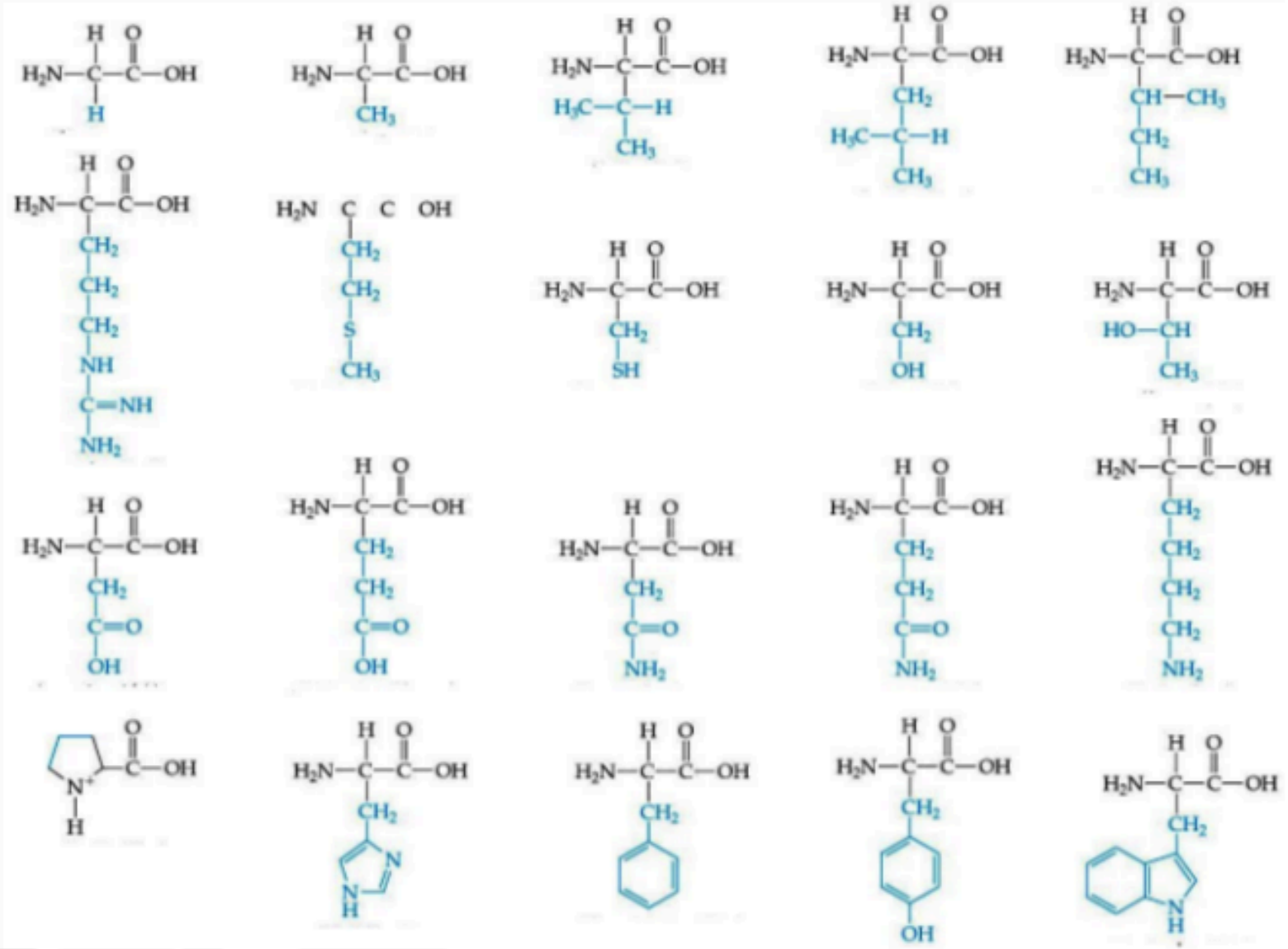


How does the presence of H-bond interactions influence a compound's physical properties? why is H2O so different?

Compounds	CH_4	NH_3	OH_2	FH	Ne
molecular weight	16.04	17.02	18.02	20.01	20.18
bond electronegativity	0.45	0.94	1.34	1.88	N/A
# of electrons	10	10	10	10	10
# of bonds	4	3	2	1	0
melting point	-182°C	-77.7°C	**0°C**	-83°C	-248.6°C
boiling point	-161.5°C	-33.4°C	**100°C**	19.5°C	-246.1°C

How does one answer this?

Circle the **regions** of these molecules that are primarily hydrophobic.



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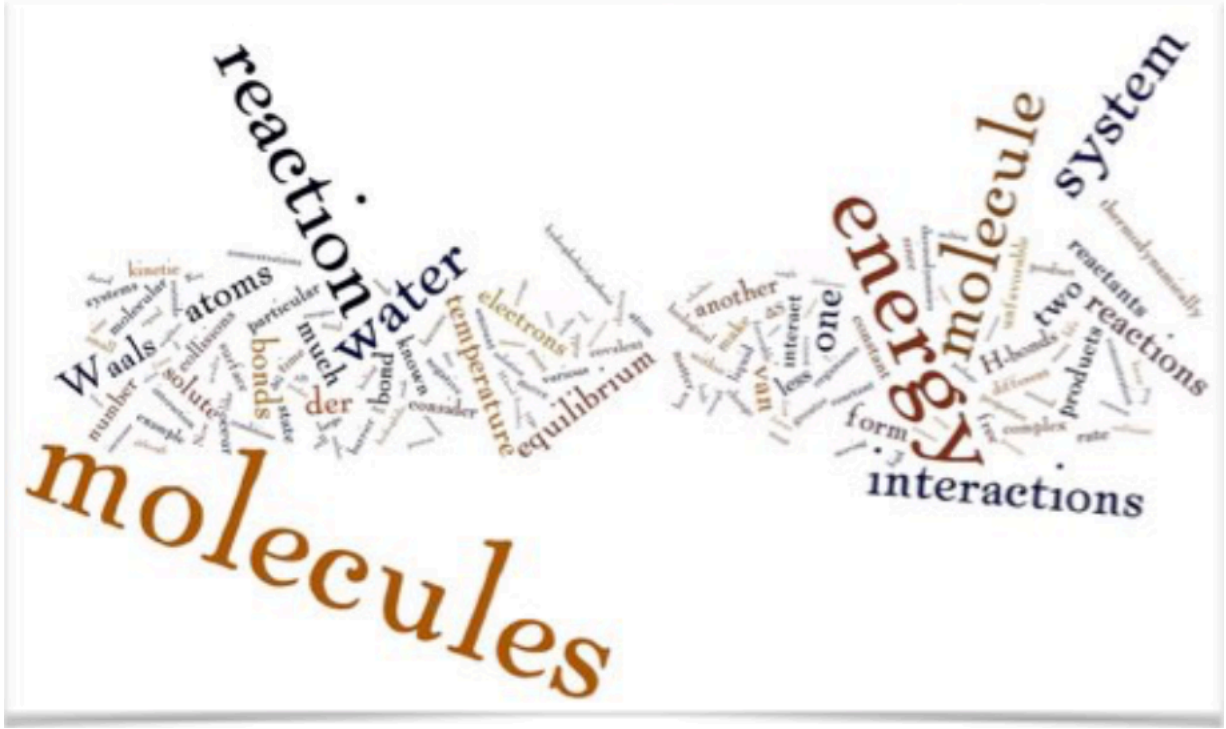
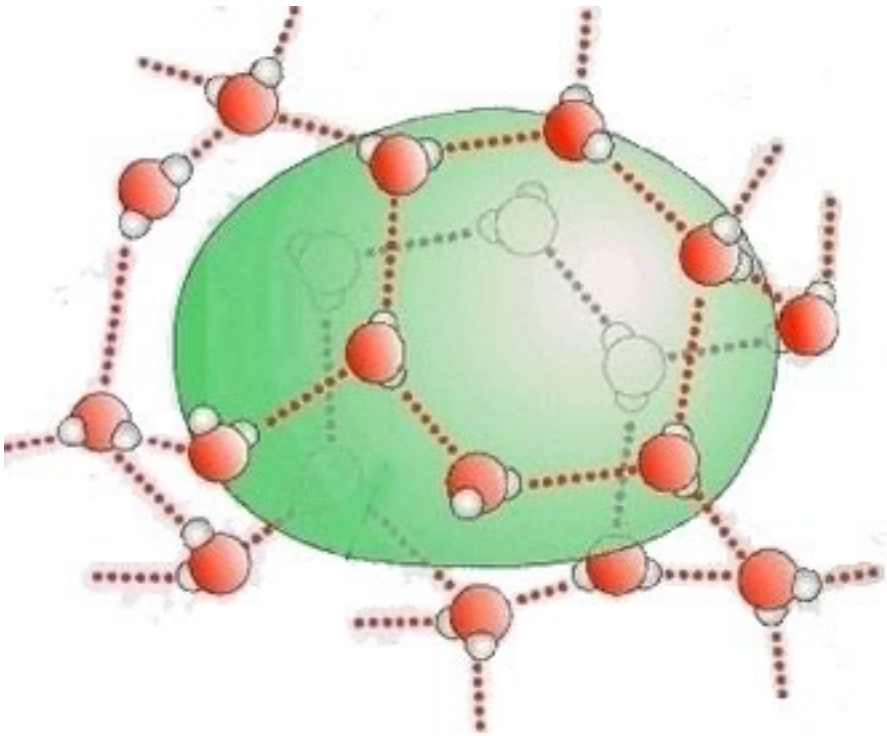


Next: building membranes

course web site

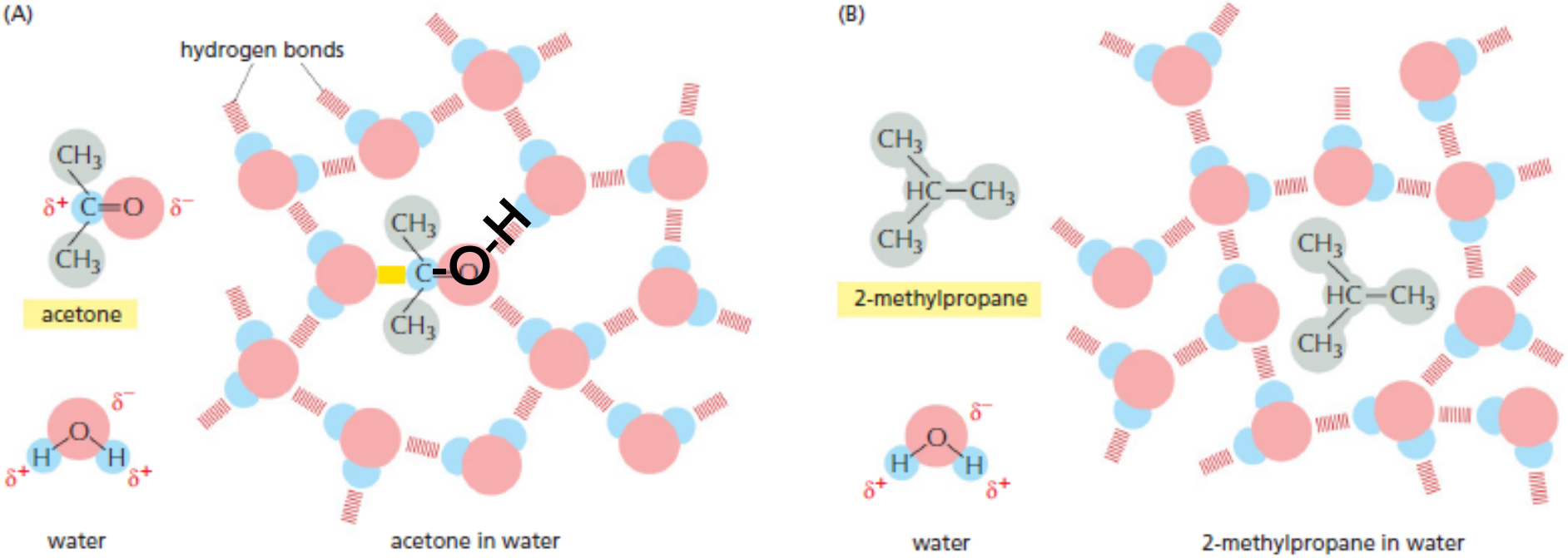
How do water molecules interact with a non-polar molecule (that is, a molecular that does not have polarized bonds)?



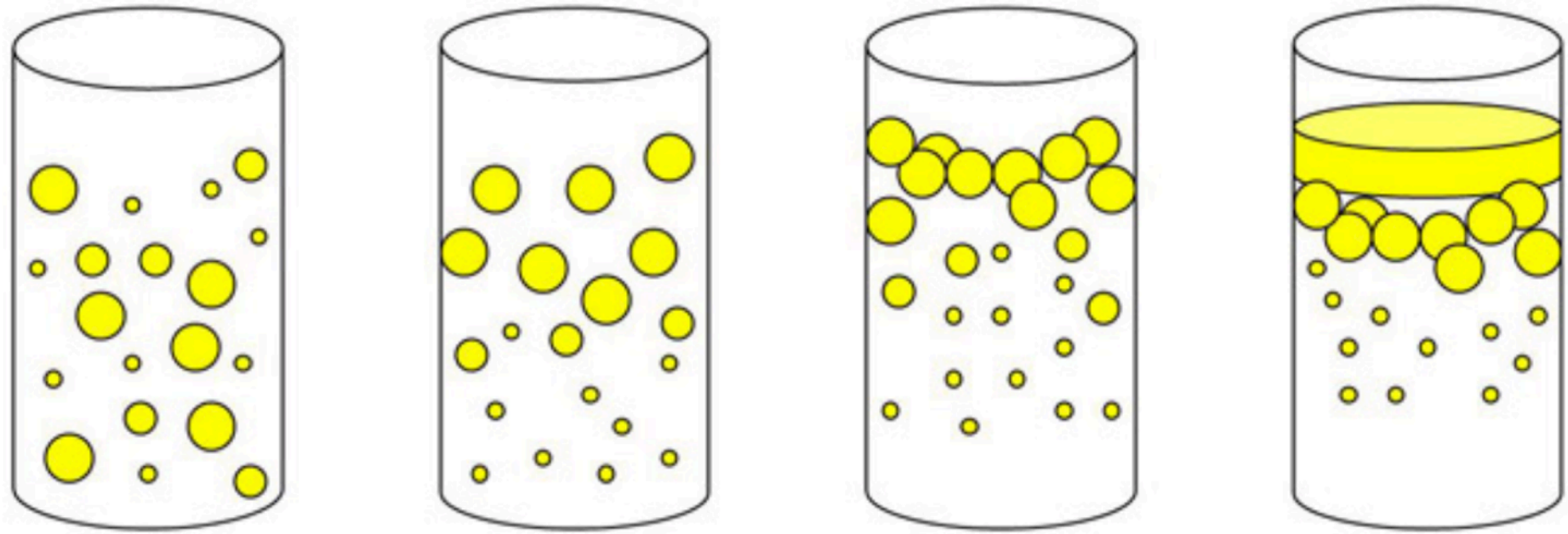
solution: mixed molecules of solute in solvent

emulsion: drops of one liquid in another

colloid: particles of a solid in solution

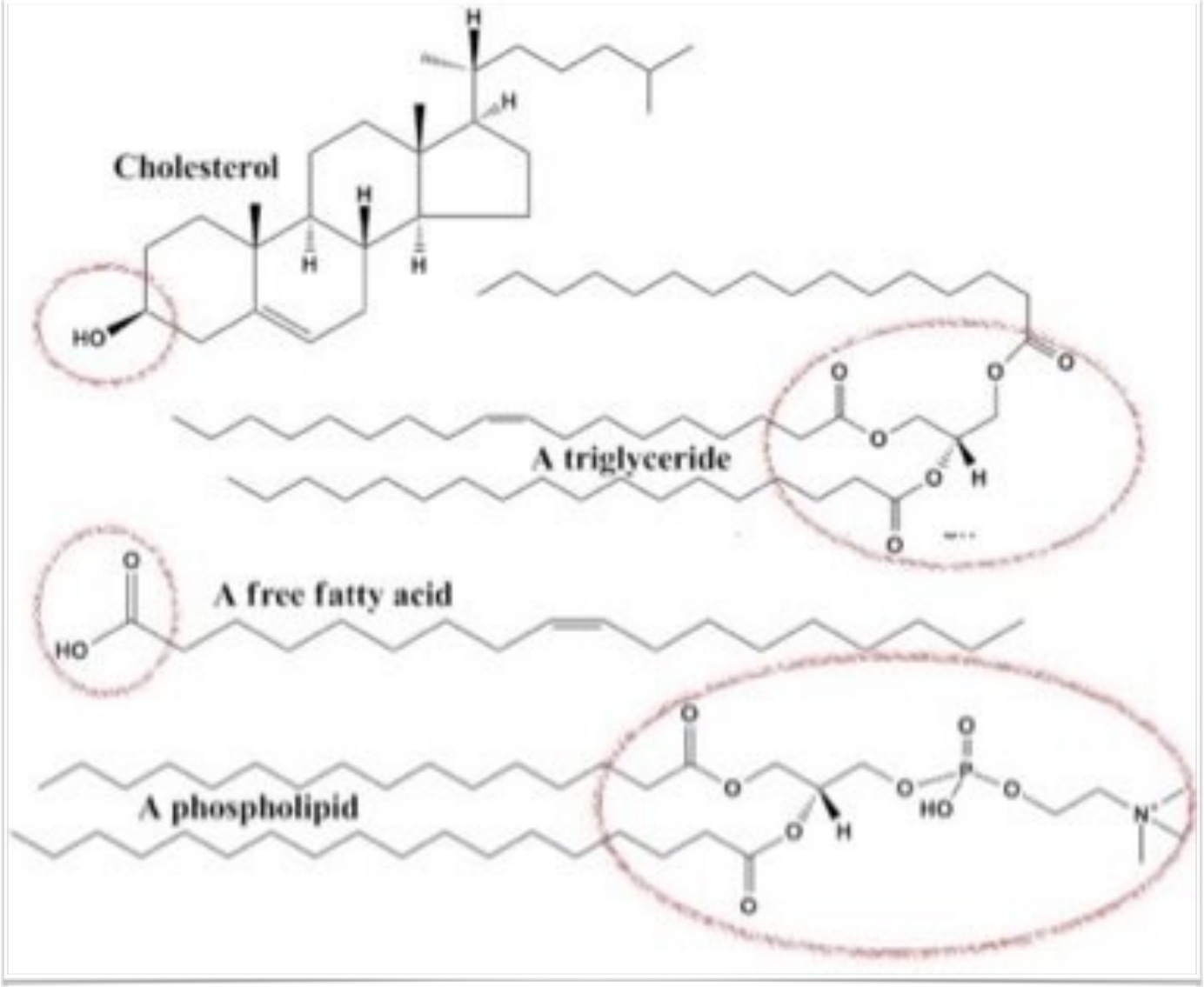

(A)
hydrogen bonds
CH3
δ+ C=O δ−
CH3
acetone
δ−
O
H H
δ+ δ+
water
CH3
C-O-H
CH3
acetone in water
(B)
CH3
HC—CH3
CH3
2-methylpropane
δ−
O
H H
δ+ δ+
water
CH3
HC—CH3
CH3
2-methylpropane in water

What happens over time to an oil-water emulsion?



Why does this happen?

What is a lipid? How do I recognize one?



How does a lipid molecule interact with water?

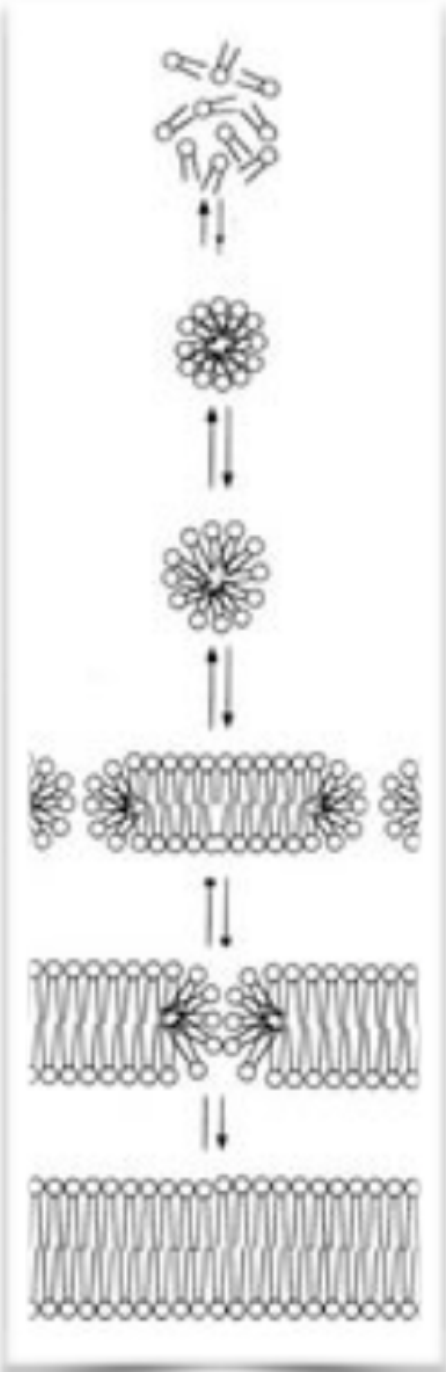
how does it interact with other lipid molecules (in water)

what types of (stable) structures can it form (in water)?

what would happen if you removed most of the water?

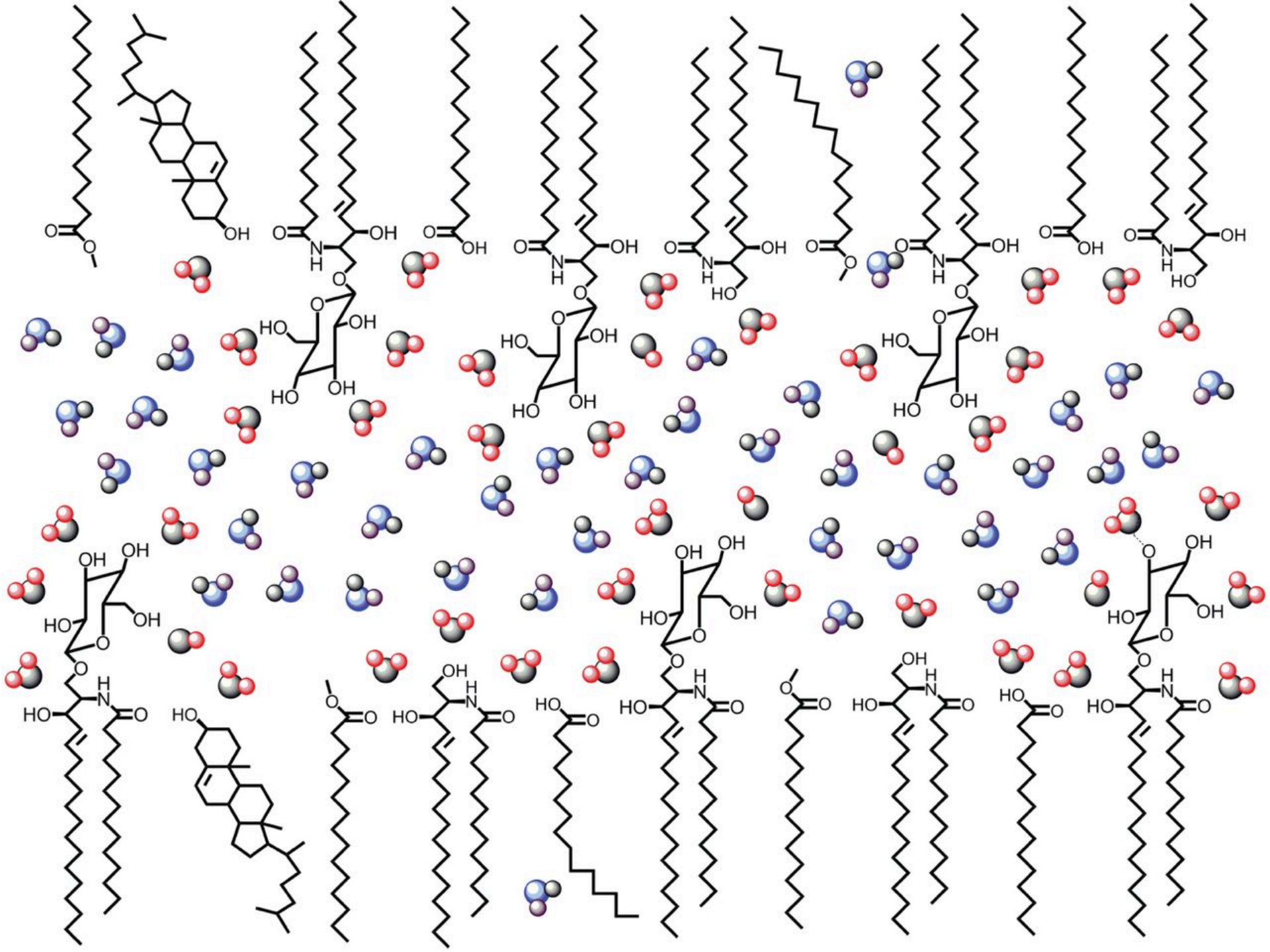
why is a bilayer better a better choice than a micelle for a cell's boundary membrane?

plausible steps in de novo membrane assembly…



simulation - micelle formation

simulation - bilayer formation



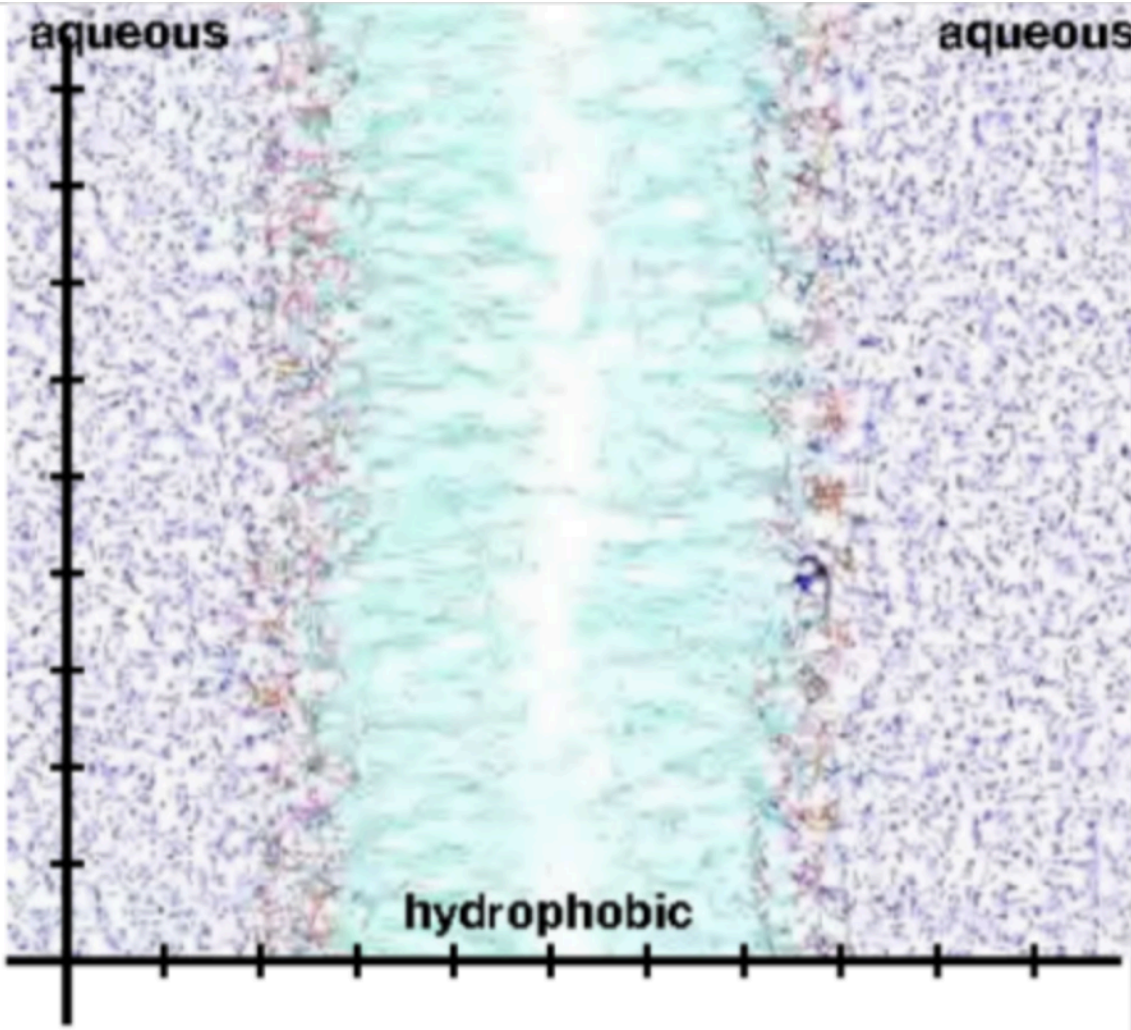
molecular simulation of membrane + water

What explains the different movements of the water molecule?

how do small hydroapathetic molecules interact with membranes?

Make a graph for the FREE energy associated with a hydrophilic molecule as it moves through a membrane.

Explain your reasoning, and indicate where, at equilibrium, would most of these hydrophilic molecules be located.

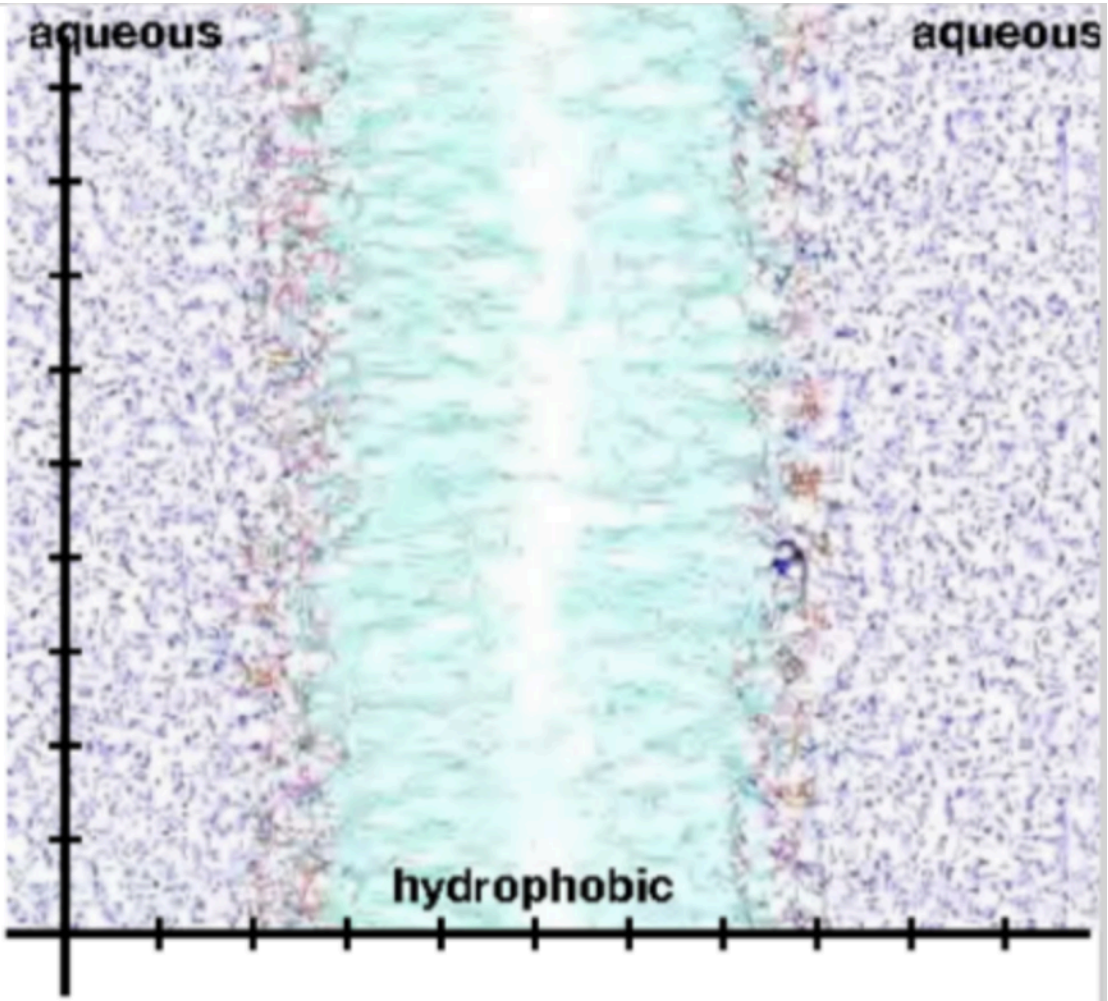


Draw Adjust Erase ✓Check ✗Reset

negative free energy = favorable
positive free energy = unfavorable

Make a graph for the energy associated with a hydrophobic molecule as it moves through a membrane.

Explain your reasoning, and indicate where, at equilibrium, would most of these hydrophbic molecules be located.



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negative free energy = favorable
positive free energy = unfavorable

Questions to answer:

84. Draw diagrams to show how increasing the length of a lipid's hydrocarbon chains affects the structures that it can form and use your diagrams to explain how the effects at the hydrophobic edges of a lipid bilayer are minimized?

85. Some lipids have phosphate groups attached to the glycerol as well as fatty acids - explain how the presence of “phospho-lipids" will impact membrane structure and stability.

86. Make a set of general rules on the effects of size and composition on the ability of a molecule to pass through a membrane.

90. What does it mean to move up (against) a concentration gradient? Is this a favorable or unfavorable event?

91. Where does the energy involved in moving molecules come from?

92. What happens to the movement of molecules through channels and transporters if we reverse the concentration gradients across a membrane?

93. Draw a diagram to show how K+ ions are transported by an ionophore across a membrane. Draw a graph to show how the potential energy changes as the ion moves. Be sure to include the relative concentrations.

Friday 13 Oct.	Chapter 6.2 Membranes and capturing energy	135-139	**Complete** beSocratic #17
Monday 16 Oct.	Chapter 6.3 Membranes and capturing energy	139-144	**Complete** beSocratic #18
Wed. 18 Oct.	Chapter 6.4 Membranes and capturing energy	144-150	**Complete** beSocratic #19
Friday 20 Oct.	**REVIEW for midterm #2**		previous midterm
Monday 23 Oct.	**second midterm exam**		exam answers