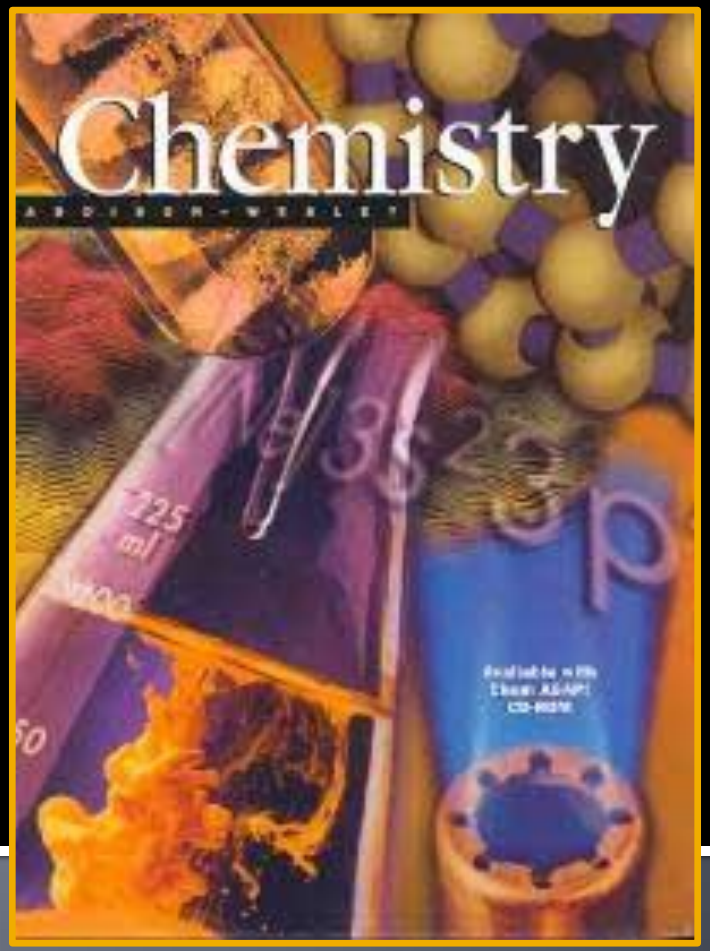
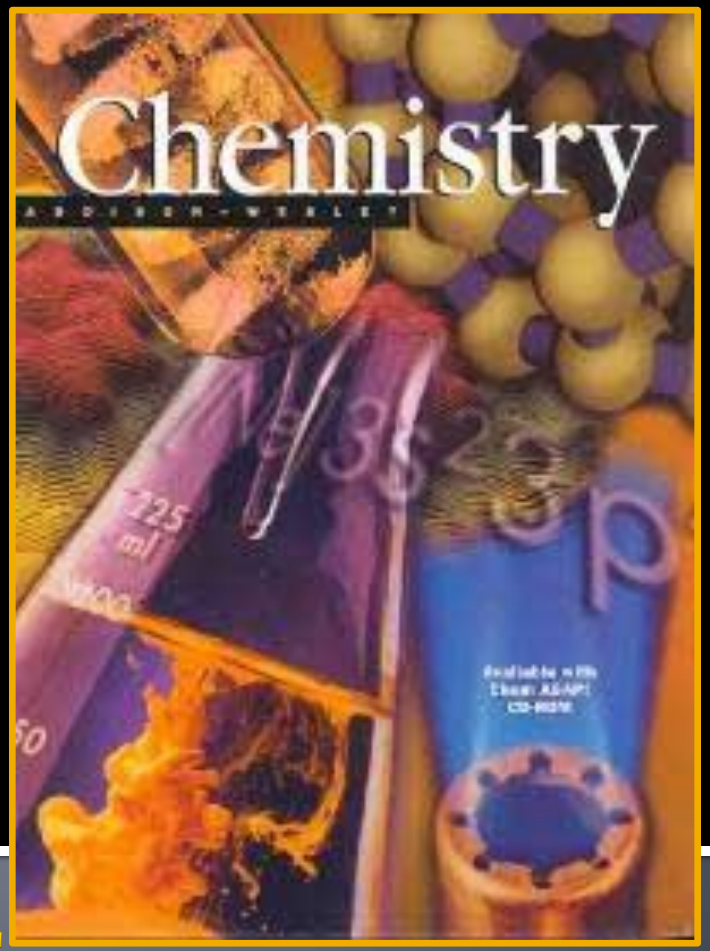
VERITAS

Chemistry Class



Mrs. Morales

Chapter 17



Water and Aqueous Systems

Aqueous Solutions

Aqueous solutions are those that are water-based, comprised of water and a dissolved substance such as salt or sugar.

In an aqueous solution, like salt water, the dissolving medium (water) is called the *solvent*.

The dissolved particles (salt), are called the *solute*.

The Solution Process

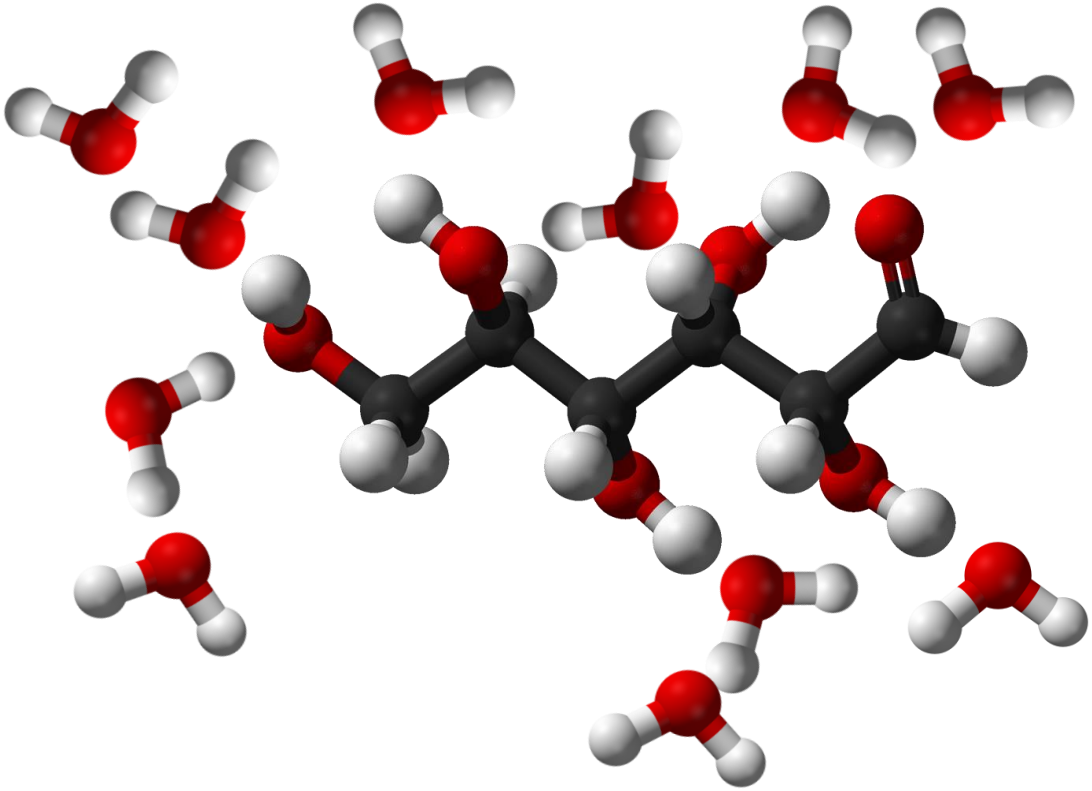
https://www.youtube.com/watch?v=EBfGcTAJF4o

Solvation is the process by which a solute dissolves. For ionic solutions, the negatively and positively charged ions become surrounded with solvent molecules.

Not all ionic compounds are solvated in water. If the attractions between the ions in the crystal are stronger than the attractions exerted by water, the crystal will remain intact.

Like Dissolves Like

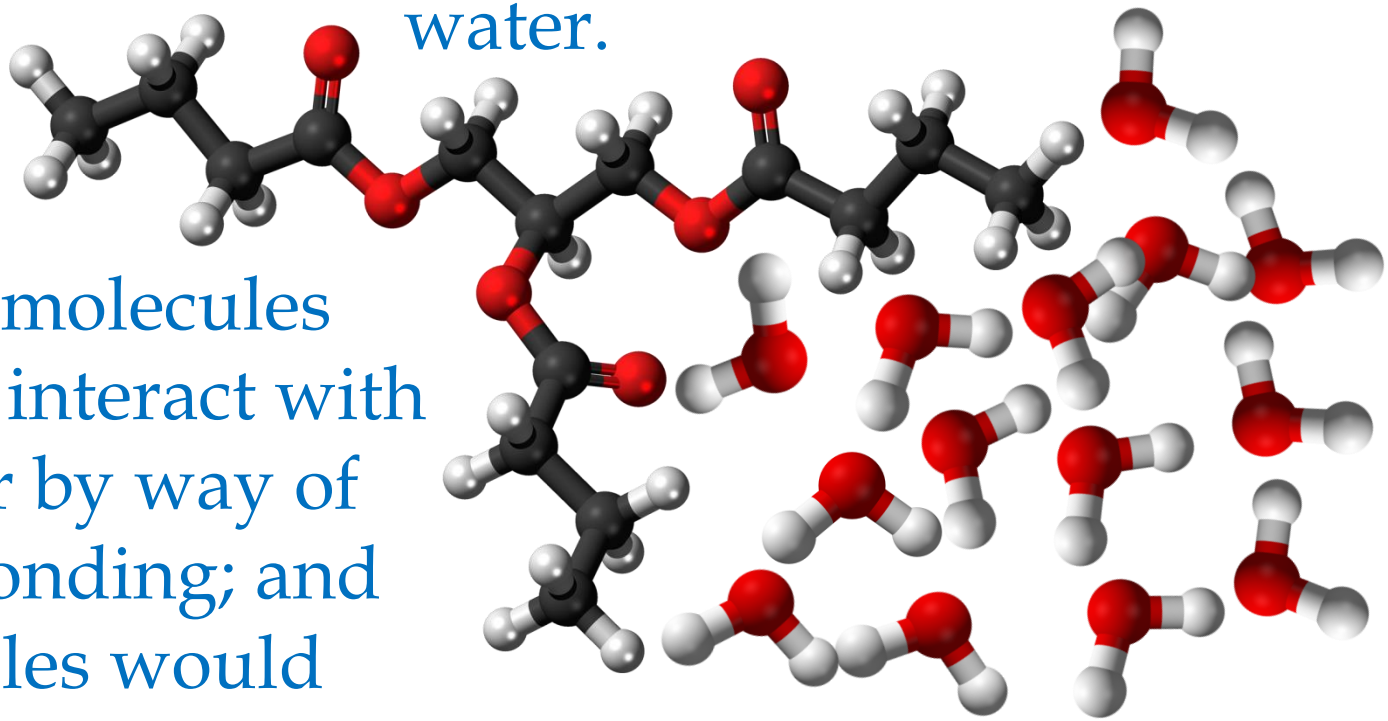
Sugars such as glucose will dissolve in water, because the –OH groups make them *resemble* water.



The water molecules are just as happy to form hydrogen bonds with the –OH groups on the sugar as they are with each other! Thus, sugar dissolves in water.

Like Dissolves Like

Oil will not dissolve in water, because it is too *unlike* water.

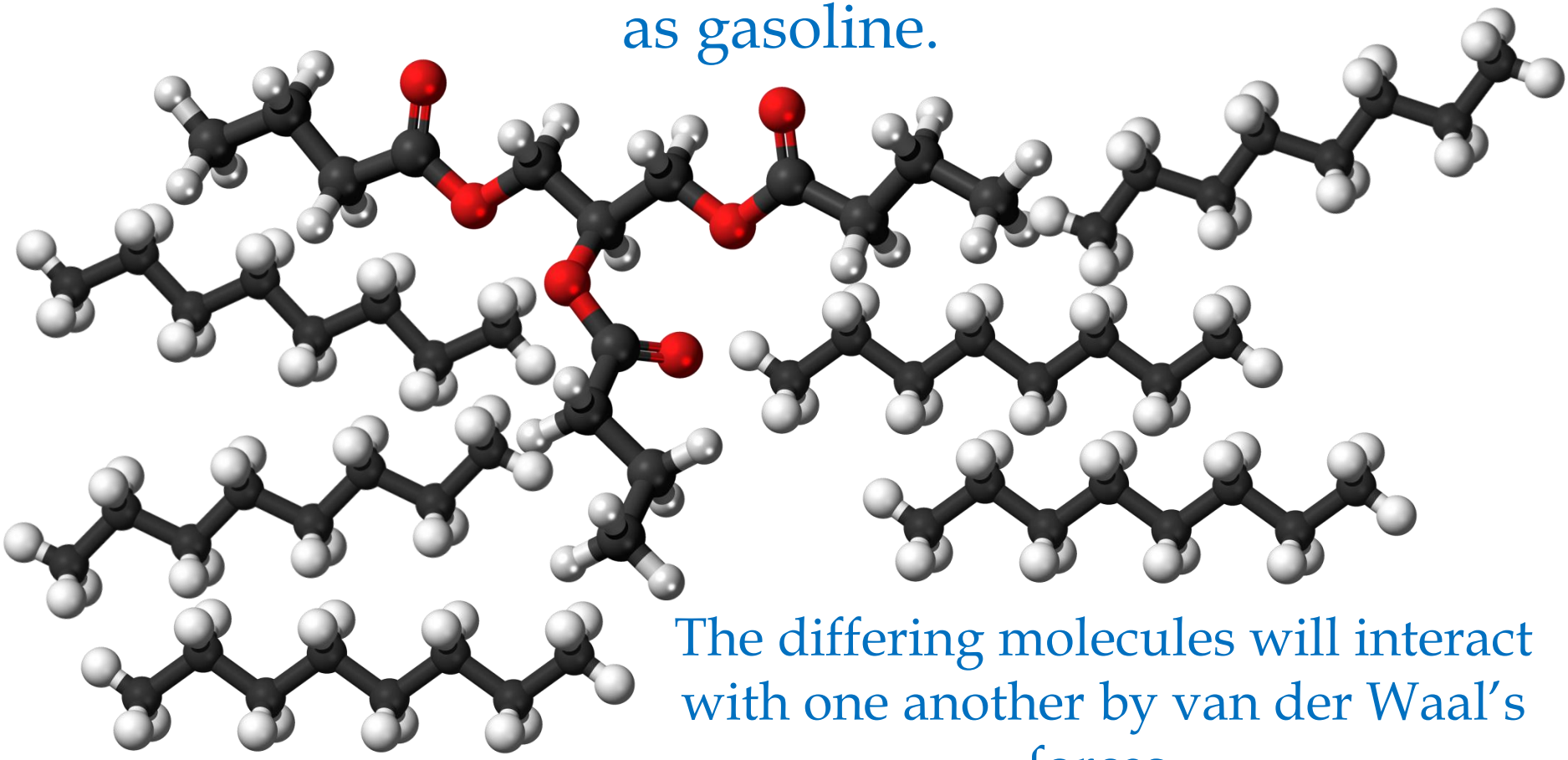


The water molecules would rather interact with one another by way of hydrogen bonding; and oil molecules would rather interact with one another by way of van der Waals forces.

Thus, oil and water will have nothing to do with one another!

Like Dissolves Like

Oil will dissolve in a solvent that looks like it – such as gasoline.



The differing molecules will interact with one another by van der Waal's forces.

Like Dissolves Like - Summary

Oil will not dissolve in water, but it will dissolve in an organic compound such as gasoline.

Oil is nonpolar, and water is very polar. Due to their differing properties of polarity, one will not dissolve in the other.

By contrast, oil and gasoline are both nonpolar, thus, because they are not repulsed by one another in any way, one will dissolve in the other.

Electrolytes and non-electrolytes

Dissolved substances that break into ions in an aqueous solution will carry a current. A solution of NaCl will conduct electricity – all ionic compounds are ***electrolytes***.

Dissolved substances that do not break into ions in an aqueous solution will not carry a current, therefore a solution of sugar water will not conduct electricity. Most molecular compounds will not conduct electricity – thus they are ***non-electrolytes***.

Properties of Solutions, Colloids, Suspensions

We have been discussing *homogeneous*, aqueous ***solutions*** up to this point.

Solutions are made up of a solvent and a solute.

The solute particles are made up of atoms, ions, and very small molecules, no larger than 0.1 – 1 nm.

Because they are smaller than visible light waves, they do not scatter light.

Their tiny particle size makes them very stable – they are only too happy to rest in a suspended state in the solvent.

Properties of Solutions, Colloids, Suspensions

Suspensions are heterogeneous mixtures, wherein distinct phases between the solvent and particles are obvious (think of a mixture of sand in water).

The particles in ***suspensions*** will settle out and rest along the bottom of the container upon standing.

Particle sizes in suspensions are huge – 1000 nm or larger! Thus, the particles are readily visible to the naked eye.

Properties of Solutions, Colloids, Suspensions

Colloids are also heterogeneous mixtures, demonstrating distinct phases between the solvent and particles (think of milk).

The particles in colloids are intermediate in size – between the size of those in a solution and those in a suspension, ranging one nm to 1,000 nm in size.

The particles are called the dispersed phase, being spread throughout the dispersing medium (which can be solid, liquid or gas).

Because the particles are larger than wavelengths of visible light, they will scatter light (Tyndall effect).

Properties of Solutions, Colloids, Suspensions

Properties of Solutions, Colloids, and Suspensions			
	System		
Property	Solution	Colloid	Suspension
Particle type	ions, atoms, small molecules	large molecules or particles	large particles or aggregates
Particle size	0.1–1 nm	1–1000 nm	1000 nm and larger
Effect of light	no scattering	exhibits Tyndall effect	exhibits Tyndall effect
Effect of gravity	stable, does not separate	stable, does not separate	unstable, sediment forms
Filtration	particles not retained on filter	particles not retained on filter	particles retained on filter
Uniformity	homogeneous	heterogeneous	heterogeneous