I) Ionic & Covalent Solutions

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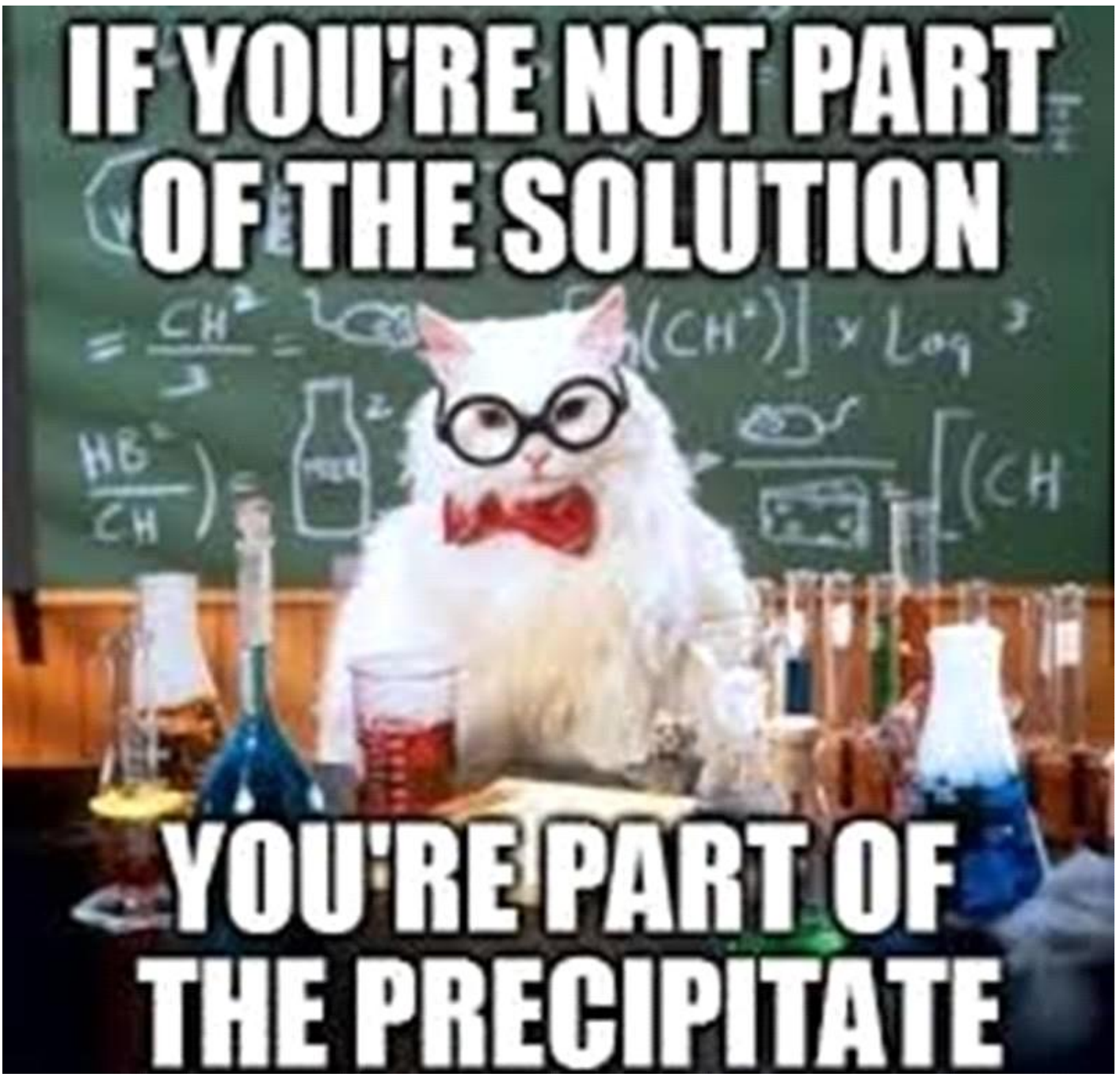
Chemistry 12

Unit III - Solubility



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https://www.youtube.com/watch?v=AN4KifV12DA

I) Ionic & Covalent Solutions

What is a **solution**? 1 phase (looks like 1 thing) homogeneous mixture → 2+ or more different components.

What are some examples of different types solutions?

Solid-solid: metal alloys (steel, brass)

Liquid-solid: salt water

Liquid-liquid: gas ; alcohol + water

Liquid-gas: pop/soda ; sparkling water (CO_2 = carbonated bev.)

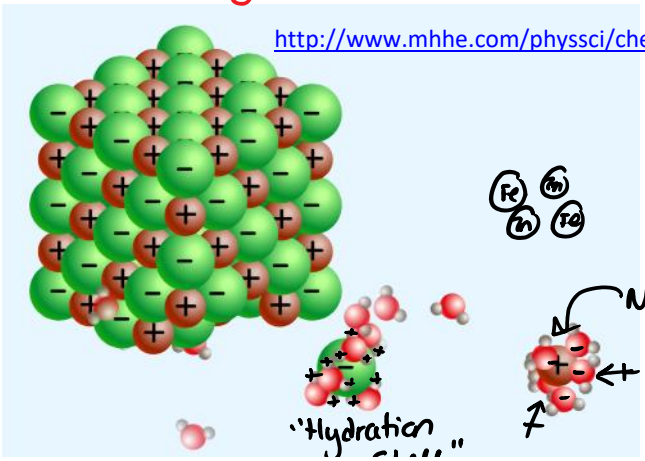
Gas-gas: air

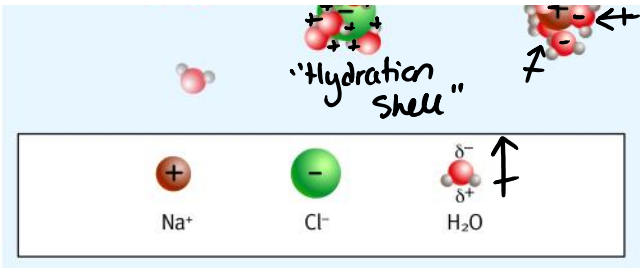
Solutions are made up of **solute(s)** and a **solvent**. Define each:

Solute: the component of the solution in the lesser amount (eg. solid being dissolved)

Solvent: the component of the solution in the greater quantity (eg. "doing the dissolving"; most often H_2O)

http://www.mhhe.com/physsci/chemistry/animations/chang_2e/molecular_view.swf





orients towards ⊕ sodium

What is the difference between an **ionic** solution and a **covalent solution**?

an ionic compound (salt ⇒ metal + non-metal) dissolved (dissociated) in H_2O to produce ions (charged particles)

a covalent compound (2^+ non-metals; neutral) that has been dissolved in H_2O.

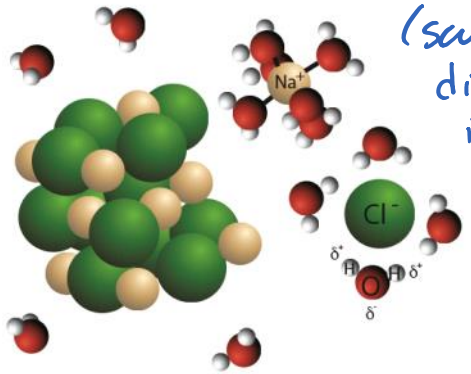


Figure 3.1.2 *NaCl dissociates in water.*

How does a solid salt such as $NaCl_{(s)}$ dissolve in water? water molecules will collide with the crystal lattice, and breaking ionic bonds by surrounding the ions (Na^+, Cl^-) in a hydration shell.

When a salt dissolves in water, it can be described as **dissolving**, but a more accurate term is **dissociation**. Why? NaCl does not "dissolve" in water, because NaCl is a neutral molecule. Instead we say NaCl "dissociates", which means it breaks apart into the charged ions (Na^+ and Cl^-).

$NaCl_{(aq)}$ is commonly used to depict table salt in solution (after dissociation has occurred). How come this is inaccurate?

Example dissociation equation for a salt: $NaCl_{(s)} \Rightarrow Na^+_{(aq)} + Cl^-_{(aq)}$ (dissociation)

*In the solubility unit, always include states when writing equations

Compounds that contain polyatomic **ions** are obviously ionic in nature (they are salts) and would dissociate in water to form ions.
Write the dissociation equation for $K_2CO_{3(s)}$ dissolving in water:

$$K_2CO_{3(s)} \longrightarrow 2K^+_{(aq)} + CO_3^{2-}{}_{(aq)}$$

Ions in solution are called electrolytes. They are what allow an ionic solution to conduct electricity (b/c of charged +/− particles)

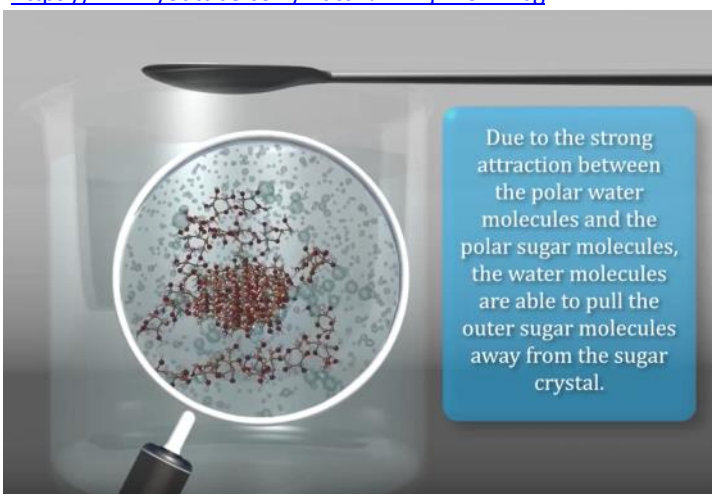
ions in solution are called _____. They are what allow an ionic solution to conduct electricity (b/c of charged ± particles)

What is a **covalent** compound (also called 'molecular compound') composed of?

- non-metals
- share electrons
- sometimes polar
- neutral (no charge)

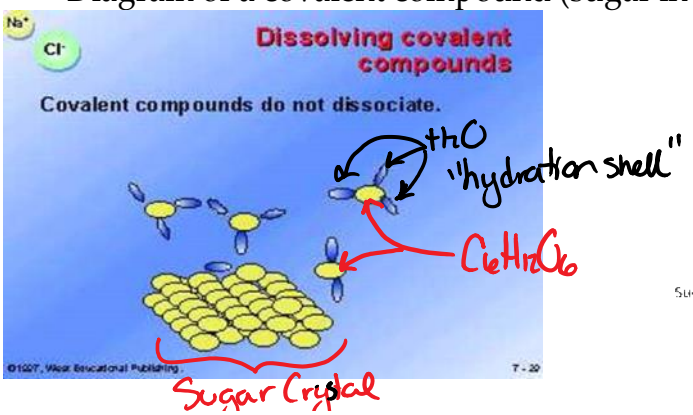
What is different about covalent compounds when they dissolve compared to ionic compounds?

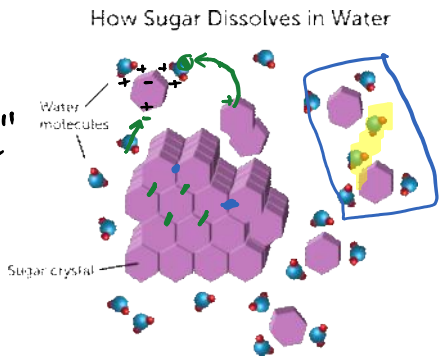
https://www.youtube.com/watch?v=fwjvwoFHTbg



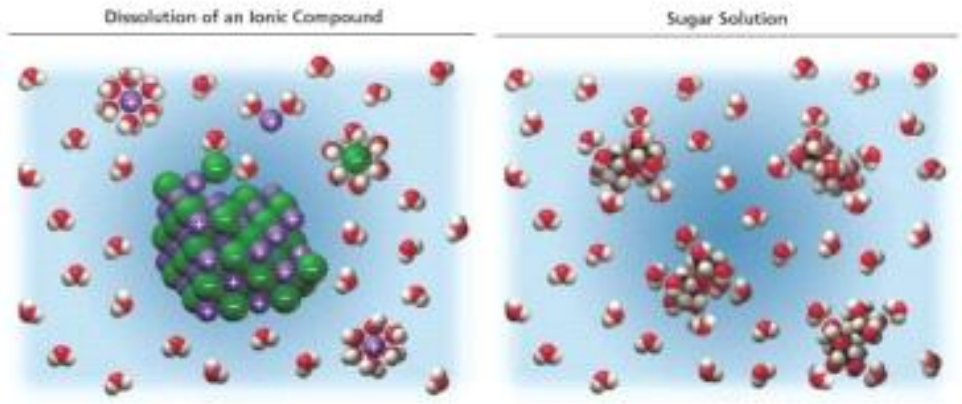
Covalent compounds may dissolve in water (if they are polar); but they do so as entire molecules. They do not dissociate like ionic compounds do.

Diagram of a covalent compound (sugar in this case) dissolving in water:





Salt vs. Sugar Dissolved in Water



ionic compounds dissociate into ions when they dissolve

molecular compounds do not dissociate when they dissolve

Write the dissolving equation for the covalent sugar compound:

$C_6H_{12}O_{6(s)} \Rightarrow C_6H_{12}O_6(aq)$

Write the dissolving equation for CH_3OH (methanol) in water:

$CH_3OH(l) \longrightarrow CH_3OH(aq)$

Do molecular (covalent) solutions conduct? Why or why not?

NO, because covalent compounds are neutral, therefore there will be no charged ions in solution.

What do we call dissolved molecular compounds?

non-electrolytes.

How can you tell the difference between ionic and covalent compounds?

metal(s) + non-metal(s) ↵

eg. NaCl, NH_4Cl, K_2CO_3 > can include polyatomic ions.

↳ 2+ non-metals

eg. $C_6H_{12}O_6$, CH_3OH