



# About Science Prof Online PowerPoint Resources

- Science Prof Online (SPO) is a free science education website that provides fully-developed Virtual Science Classrooms, science-related PowerPoints, articles and images. The site is designed to be a helpful resource for students, educators, and anyone interested in learning about science.
- The SPO Virtual Classrooms offer many educational resources, including practice test questions, review questions, lecture PowerPoints, video tutorials, sample assignments and course syllabi. New materials are continually being developed, so check back frequently, or follow us on Facebook (Science Prof Online) or Twitter (ScienceProfSPO) for updates.
- Many SPO PowerPoints are available in a variety of formats, such as fully editable PowerPoint files, as well as uneditable versions in smaller file sizes, such as PowerPoint Shows and Portable Document Format (.pdf), for ease of printing.
- Images used on this resource, and on the SPO website are, wherever possible, credited and linked to their source. Any words underlined and appearing in blue are links that can be clicked on for more information. PowerPoints must be viewed in *slide show mode* to use the hyperlinks directly.
- Several helpful links to fun and interactive learning tools are included throughout the PPT and on the Smart Links slide, near the end of each presentation. You must be in *slide show mode* to utilize hyperlinks and animations.
- This digital resource is licensed under Creative Commons Attribution-ShareAlike 3.0:  
<http://creativecommons.org/licenses/by-sa/3.0/>

Alicia Cepaitis, MS  
Chief Creative Nerd  
Science Prof Online  
Online Education Resources, LLC  
[alicia@scienceprofonline.com](mailto:alicia@scienceprofonline.com)

Tami Port, MS  
Creator of Science Prof Online  
Chief Executive Nerd  
Science Prof Online  
Online Education Resources, LLC  
[info@scienceprofonline.com](mailto:info@scienceprofonline.com)

# Chemical Solute, Solvents & Solubility



# Solutions

**Solutions** are *homogeneous mixtures* in which one substance is dissolved in another.

**Solutions** have two parts: **solute** and **solvent**

**Q:** Which is the substance that is dissolved?

So the substance that **does the dissolving** is called the... ?

**Homogeneous** means that the components of that mixture (the solute and the solvent) are evenly distributed.

A **heterogeneous** mixture is made of different substances that remain physically separate.



# Solubility

(mixability)

A measure of how much of a given substance will dissolve in a liquid.

Relates to whether the molecules involved are **polar** or **non-polar**.

A substance that does not dissolve is **insoluble**. *Example: Oil is insoluble in water.*

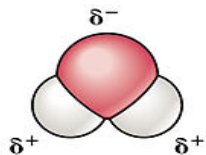
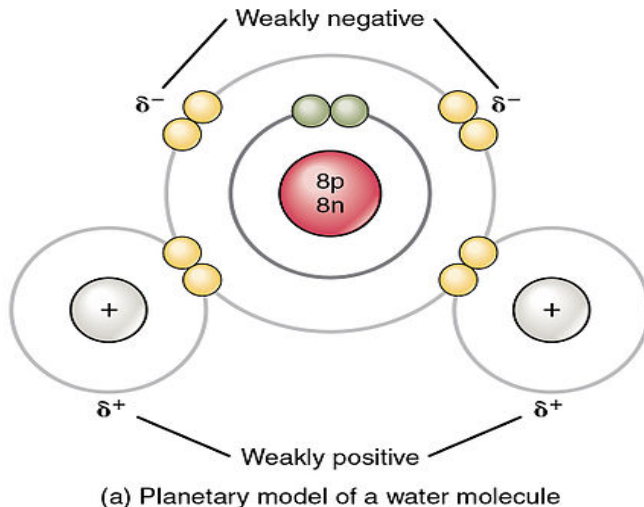
A substance that does dissolve is called **soluble**. *Example: Sugar is soluble in water.*



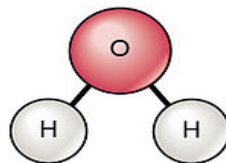


# Polar vs. Non-Polar Covalent Bonds

**Polar molecules** unequally share electrons between atoms, so have a slight positive charge at one end and a slight negative charge at the other.

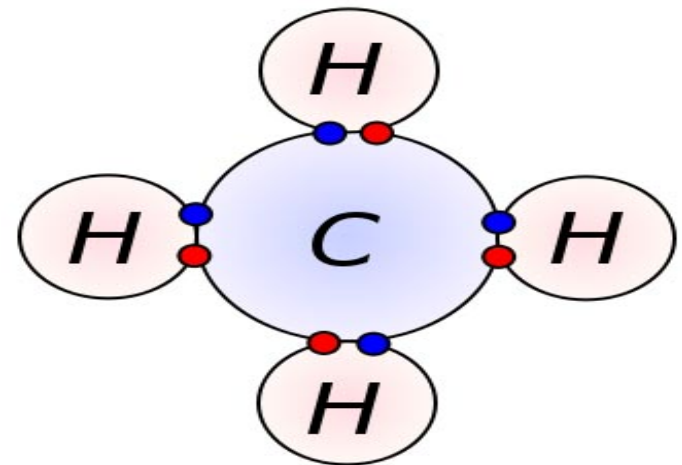


(b) Three-dimensional model of a water molecule



(c) Structural formula for water molecule

**Non-polar molecules** have electrons equally shared between their atoms.



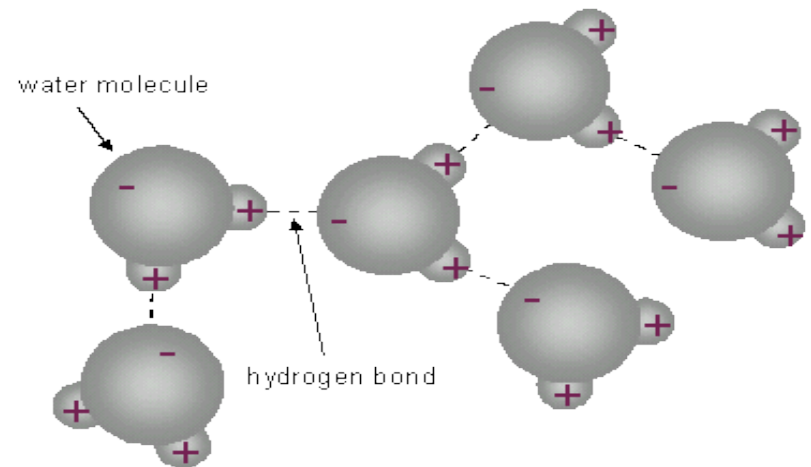
● Electron from hydrogen  
● Electron from carbon

**Video:**  
[Polar & Non-Polar Molecules](#)  
from Crash Course Biology

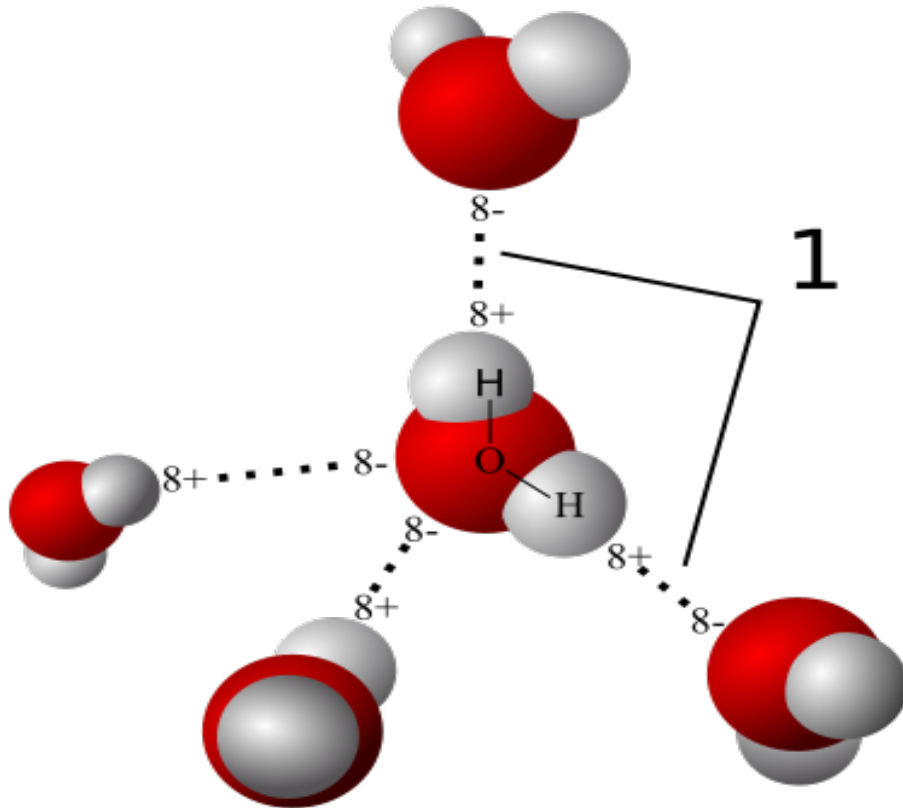
# Water is a unique substance due to its ability to make many **Hydrogen Bonds**

## Examples:

- Water is a liquid at room temp.
- Most substances the size of water are gases.
- Ice floats.
- Usually a solid is denser than its liquid



# Cohesion and Adhesion of Water



- **Cohesion:** Water sticks to itself by H-bonding
  - Surface tension
- **Adhesion:** Water clings to other substances
  - Allows capillary action

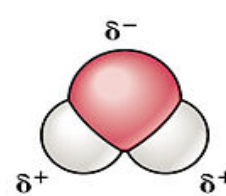
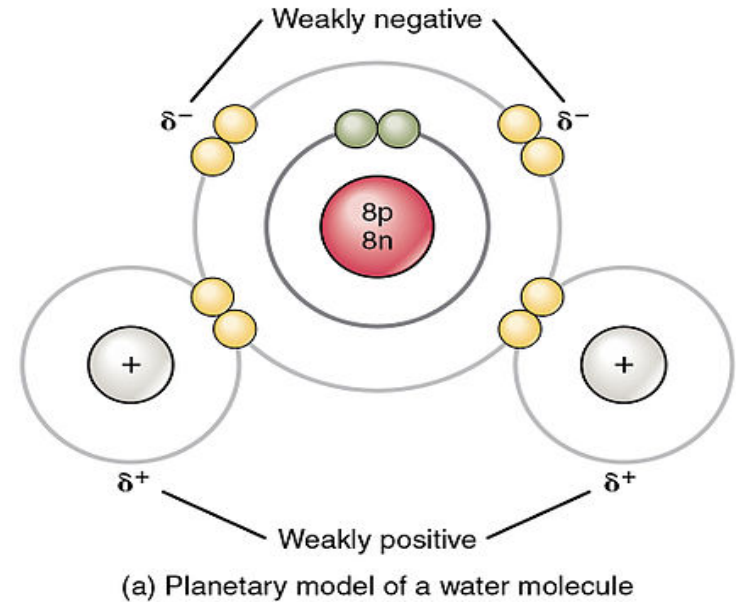
# Water is a good solvent for many other polar solutes.

## Polar Covalent Molecules include:

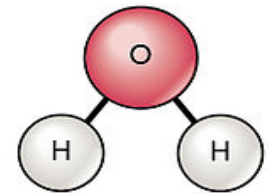
- Ammonia  $\text{NH}_3$
- Glucose  $\text{C}_6\text{H}_{12}\text{O}_6$
- Urea  $(\text{NH}_2)_2\text{CO}$

\*High ratio of O's and N's tend to make a molecule polar.

For example, **blood** is a water based solution.



(b) Three-dimensional model of a water molecule



(c) Structural formula for water molecule

# Water is also a good solvent for ionic compounds.

(a.k.a. salts & electrolytes)

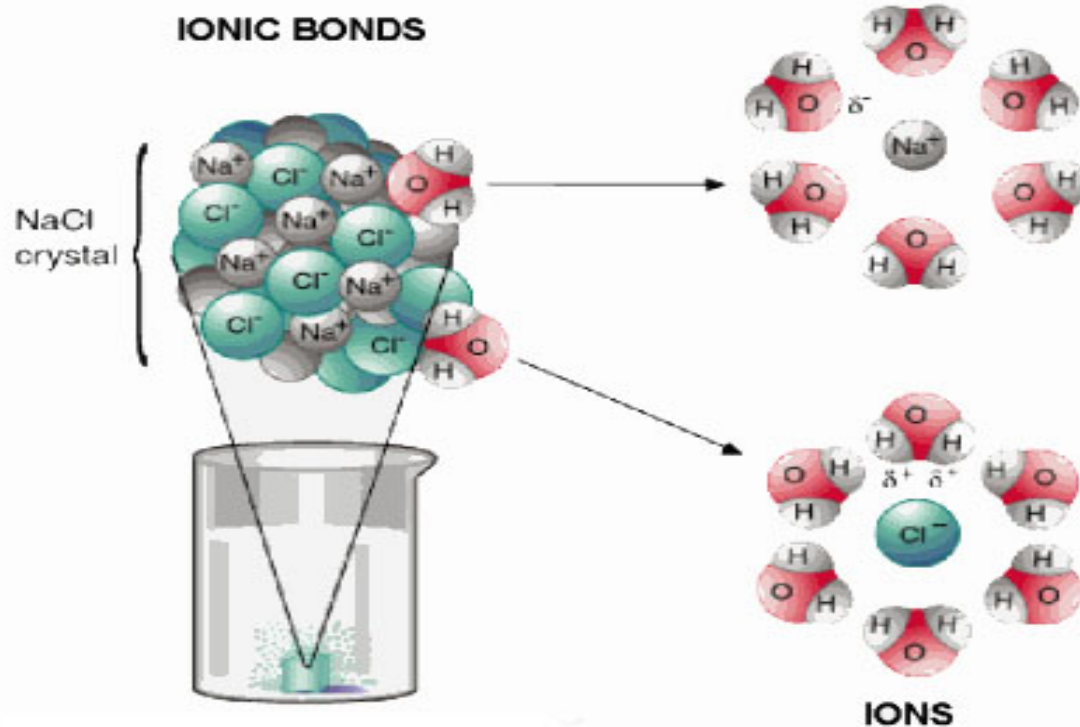


The partial and full charges attract each other.

Salts **dissociate** into their ions in water.

[Video](#) of dissociation of NaCl into water.

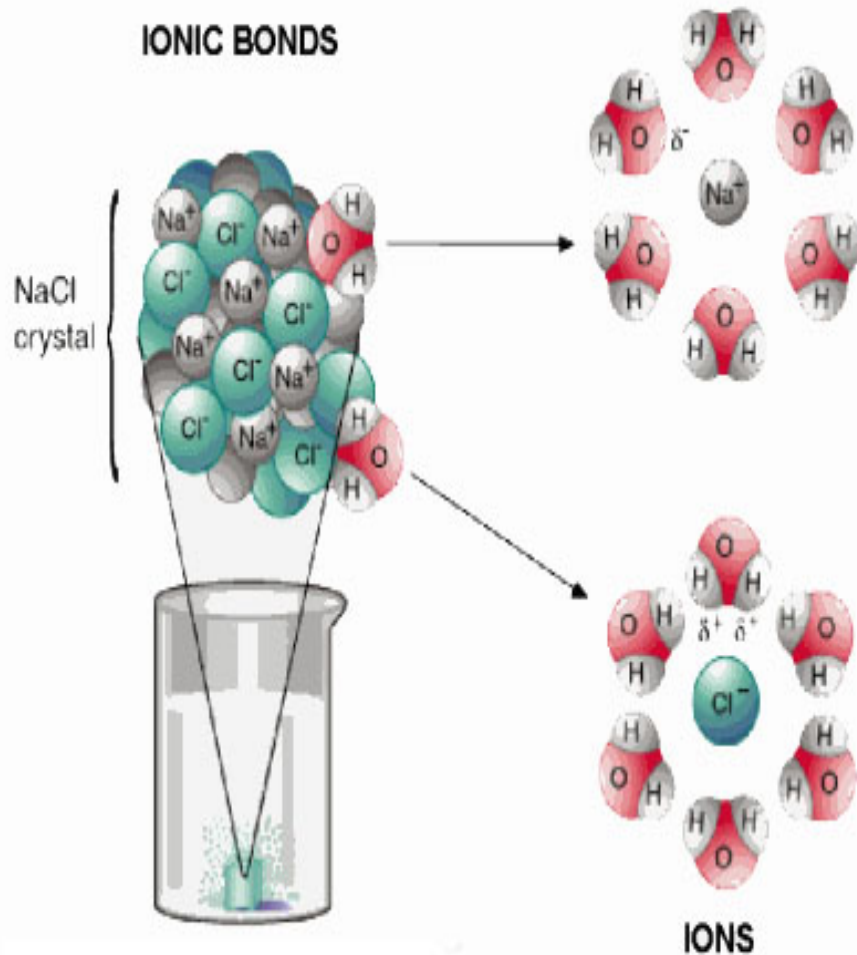
[Video clip](#) from movie **Idiocracy**:  
"Brawndo Has What Plants Crave!"



# What determines solubility?

**Like Dissolves  
Like Rule**

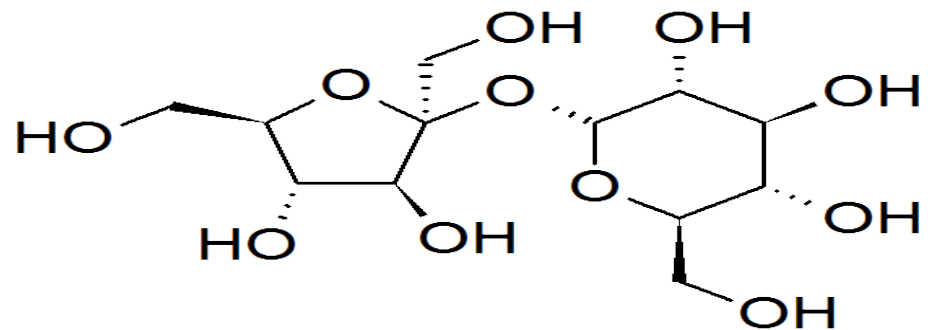
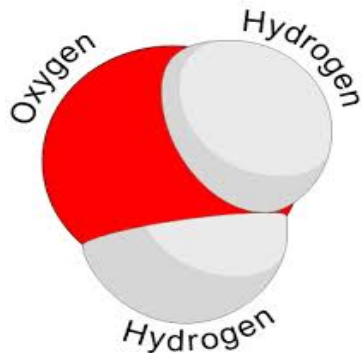
Substances with  
charges (full or partial)  
like to mix with  
one another.





# Hydrophilic

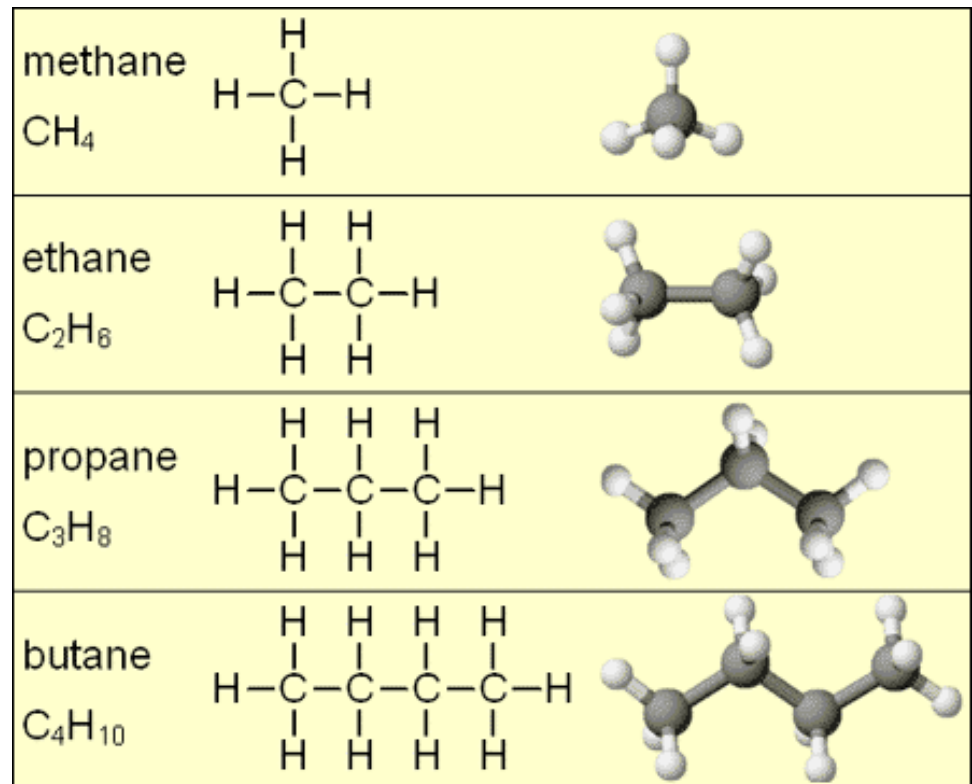
- from the Greek (hydros) "water" and (philia) "friendship"
- Water loving
- Water soluble
- **Example:** Water & sugar



# Non-Polar substances DO NOT carry any kind of charge

Mainly molecules  
made of C's and  
H's.

**Example:** Oily or  
gasoline based  
substances



# Opposite of Hydrophilic

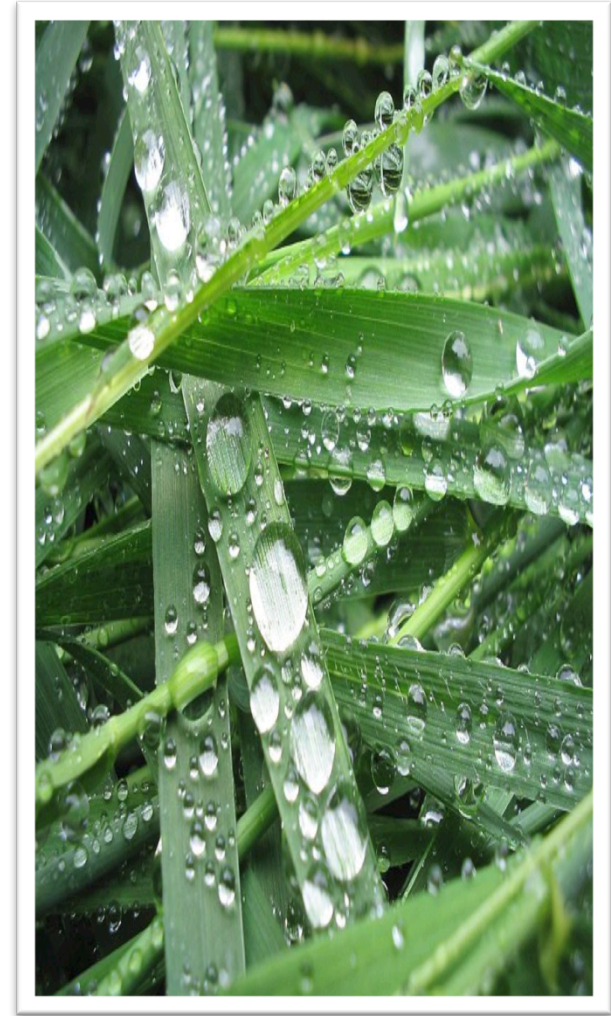
## Hydrophobic

- from the Greek (hydros) "water" and (phobia) "fearing" or "hating"
- Water-fearing
- Not water soluble
- **Example:** Cholesterol is not water soluble

Non-polar solvents dissolve non-polar solutes.

## Examples:

- Turpentine dissolves oil-based paints.
- Cholesterol is important component of greasy cell membranes.



# What determines solubility?



**Like Dissolves  
Like Rule**

Non-polar solvents  
dissolve non-polar  
solutes.

# Oil and Water Don't Mix

**Hydrophobic**  
&  
**Hydrophilic**  
substances  
DO NOT MIX

Examples: Salad dressing,  
grease fire and water

**Insoluble:** Substances that  
do NOT mix in each other.  
Solute does not dissolve.  
Line of separation.





# Confused?

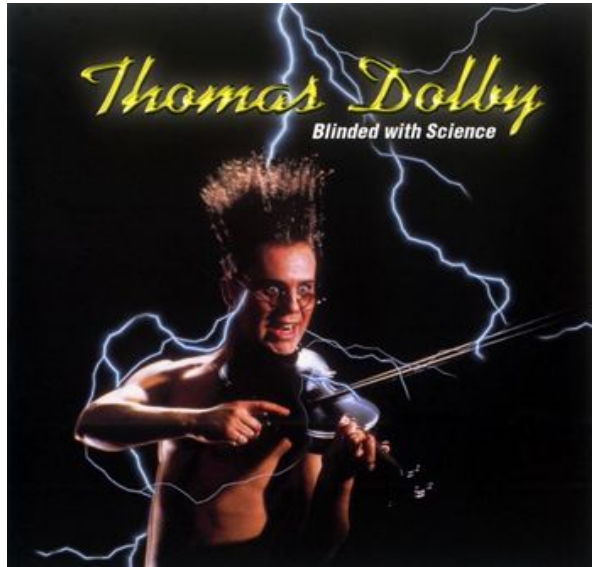
Here are some links to fun resources that further explain **Inorganic & Covalent Compounds & Solutions**:

- [Video](#) of dissociation of NaCl into water.
- [Video clip](#) from movie **Idiocracy**: "Brawndo Has What Plants Crave!"
- [Polar & Non-polar Molecules](#) from Crash Course Chemistry #23.

Smart Links







Are you feeling blinded by science?

*Do yourself a favor. Use the...*

## Virtual Cell Biology Classroom (VCBC)!

The VCBC is full of resources to help you succeed,  
including:



- practice test questions
- review questions
- study guides and learning objectives
- PowerPoints on other topics

You can access the VCBC by going to the Science Prof Online website  
[www.ScienceProfOnline.com](http://www.ScienceProfOnline.com)