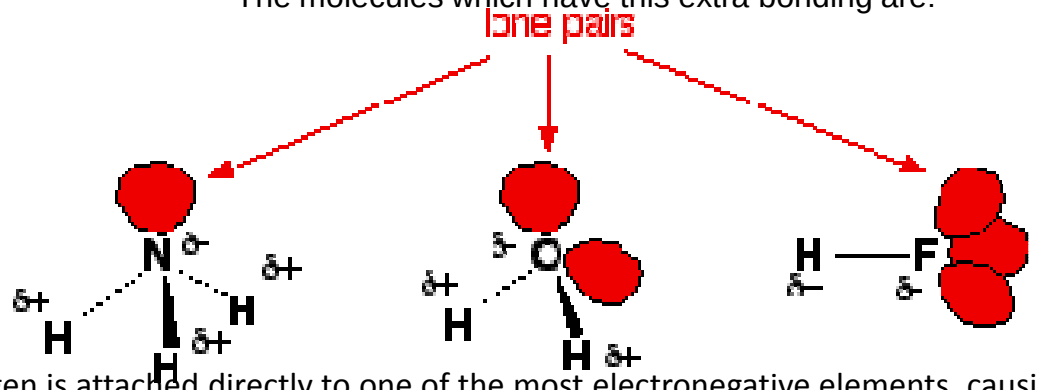
Chapter 11 extra slides

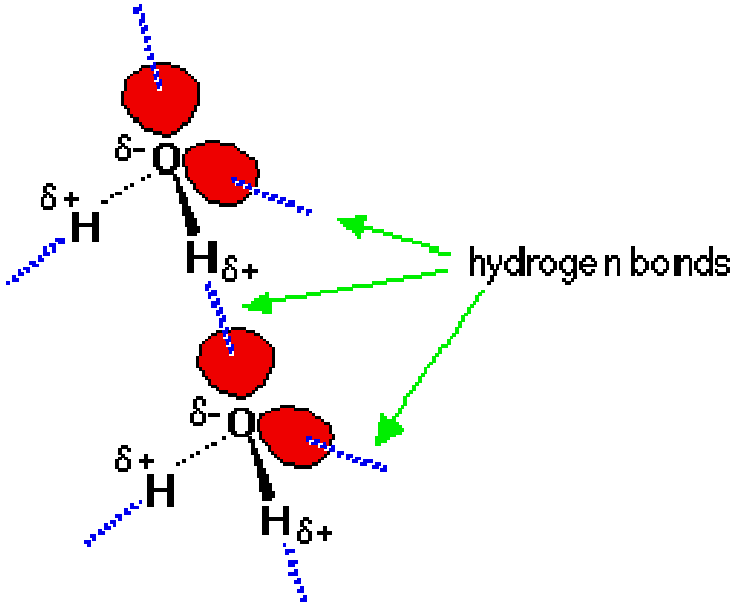
The origin of hydrogen bonding

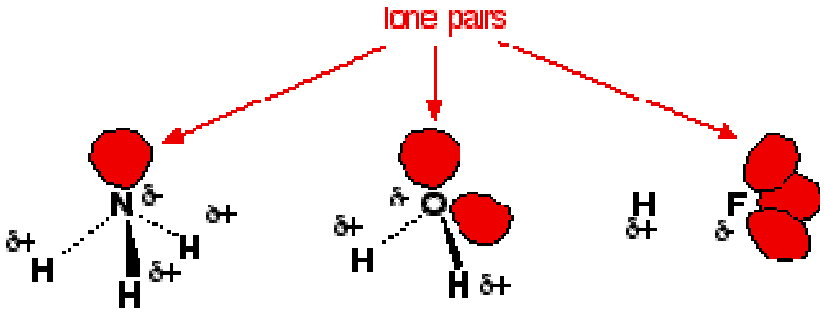
The molecules which have this extra bonding are:



- The hydrogen is attached directly to one of the most electronegative elements, causing the hydrogen to acquire a significant amount of positive charge.
- Each of the elements to which the hydrogen is attached is not only significantly negative, but also has at least one "active" lone pair.
- Lone pairs at the 2-level have the electrons contained in a relatively small volume of space which therefore has a high density of negative charge. Lone pairs at higher levels are more diffuse and not so attractive to positive things.

- Ref: http://www.chemguide.co.uk/atoms/bonding/hbond.html

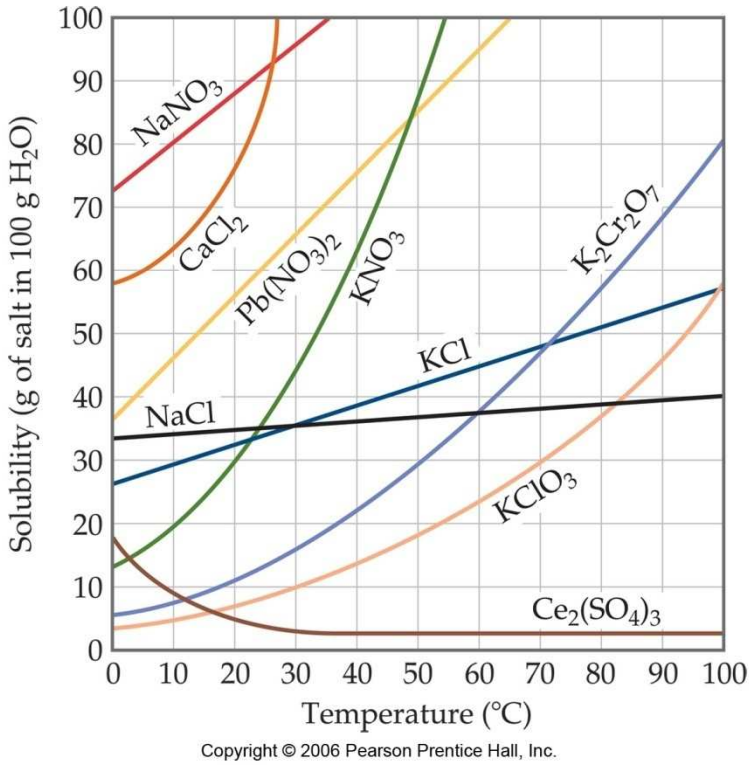




- Each water molecule can potentially form four hydrogen bonds with surrounding water molecules. Since there are exactly the right numbers of positively charged hydrogen atoms and lone pairs , every one of them can be involved in hydrogen bonding.
- .This is why the boiling point of water is higher than that of ammonia or hydrogen fluoride. In the case of ammonia, the amount of hydrogen bonding is limited by the fact that each nitrogen only has one lone pair. In a group of ammonia molecules, there aren't enough lone pairs to go around to satisfy all the hydrogen atoms.
- In hydrogen fluoride, the problem is a shortage of hydrogen atomss. In water, there are exactly the right number of each. Water could be considered as the "perfect" hydrogen bonded system.

Chapter 13 extra slides

Why is the solubility of some salts not affected by temperature



Simply put, three processes affect the energetics of the process:

Separation of solute particles ΔH_1 (this is always endothermic)

Separation of solvent particles ΔH_2 (this too is always endothermic)

New interactions between solute and solvent ΔH_3 (this is always exothermic)

The overall enthalpy change associated with these three processes :

$\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$

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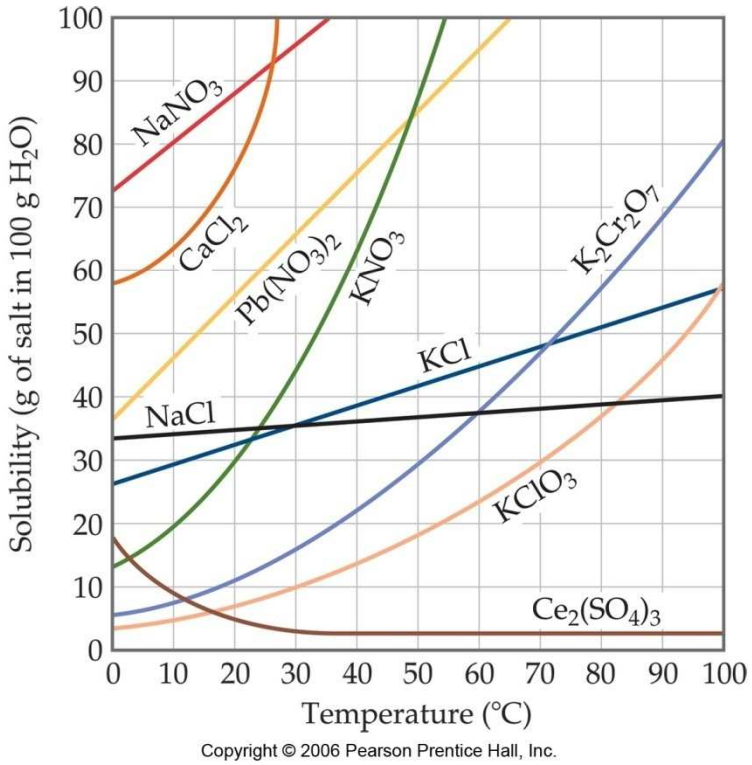

$\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$

And we learnt that the solution process is endothermic or exothermic depending upon the balance of

$(\Delta H_1 + \Delta H_2)$ and ΔH_3

The endothermic ones will dissolve more with the increase of temperature, the exothermic ones will dissolve less at higher temperature.

The ones that are neither will be affected the least