6) "Like dissolves like"

Question:

You can often find that the rule "like dissolves like" is interpreted as "non-polar chemicals dissolve best in non-polar solvents" and "polar chemicals dissolve best in polar solvents". See for example the Wikipedia page on "Solvent" accessed in January 2008 (see Solvent-Wikipedia.pdf section marked in yellow). In this context polar solvents are typically defined as those that contain oxygen and/or nitrogen while non-polar solvents are defined as those that do not contain oxygen and/or nitrogen. Can you name some general cases that will proof these statements wrong? Use the classification that was introduced here.

b) In the same paragraph of the Wikipedia entry you can read that "The polarity can be measured as the dielectric constant or the dipole moment of a compound." Does that agree with what you have learned in this chapter?

Answer:

a) $CHCl_3$ and $CHCl_2$ are typically considered to be non-polar solvents but they will dissolve monopolar H-bond acceptor solutes much better than polar solvents such as esters, ethers or ketones will do because the latter are H-bond acceptors and therefore cannot form H-bonds with an H-bond acceptor solute.

b) There is no useful connection between the dipole moment or the dielectric constant of the solute or the solvent and partitioning of non-ionic organic compounds. This is illustrated by the data in the Table in FAQ 2 that show that the partitioning of the isomers of Dichlorobenzenes in various polar partition systems does not differ substantially despite the fact that all 3 isomers have distinctly different dipol moments while there vdW interactions are the same, and H-bonds do not exist.* The dielectric constant and the dipole moment is relevant for a solvent´s ability to dissolve charged compounds such as salts. This is beyond the scope of our text.