HW Review- Book-Ch 12—Review key

Review for Chapter 12: p. 522 #100, 102, 110, 116, 119

100) Which alcohol in prob. 12 would be the best solvent for (a) I_2; (b) KBr; (c) C_5H_{12}?

a) I_2 : pentanol is the best solvent because …….
I_2 is non-polar and n-pentanol is the least polar of the alcohols listed.

b) KBr: methanol (CH_3OH) is best solvent because..
KBr is ionic and so only the most polar solvent would be able to dissolve KBr.

c) **C_5H_{12}** : pentanol is the best solvent because…
C_5H_{12} (pentane) is non-polar and n-pentanol is the least polar of the alcohols.

Compound	Solubility in Water (g/100 g) at 20°C
CH_3OH (methanol)	∞
CH_3CH_2OH (ethanol)	∞
$CH_3CH_2CH_2OH$ (Propanol)	∞
$CH_3CH_2CH_2CH_2OH$ (butanol)	9
$CH_3CH_2CH_2CH_2CH_2OH$ (pentanol)	2.7

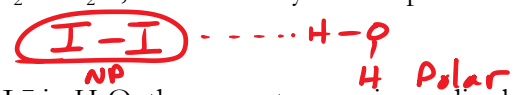
(*Note:* ∞ means that the alcohol and water are completely miscible in all proportions.)

most polar

least polar b/c has the longest NP carbon chain.

102) Describe why I_3^- is more soluble in H_2O than I_2.

For I_2 in H_2O, there are only weak dipole - induced dipole attractions.



For I_3^- in H_2O, there are stronger ion – dipole attractions.

110) How does each of the following affect solubility of an ionic compound?

(a) Lattice energy: Solubility of an ionic decreases with increasing lattice energy (Having a higher lattice energy makes it harder to break apart ions.)

(b) Solvent polarity: Ionic compounds are more soluble in a polar solvent because polar solvents have stronger attractions with the ions. (*ion hydration is more exothermic)*

(c) Enthalpies of hydration of the ions: Solubility of an ionic increases when enthalpy of hydration of the cation and anion are more favorable. *[Having more favorable enthalpies of hydration(more exothermic), means that there are stronger attractions between ions and water.]*

116) Why is ammonia very soluble in water but not nitrogen trichloride?

NH_3 can form hydrogen bonds with water; NCl_3 cannot because it is nonpolar (N & Cl have the same electronegativity value).

119) Making mayonnaise involves beating oil into small droplets in water, in the presence of egg yolk. What is the purpose of the egg yolk? (Hint: Egg yolk contains lecithins, which are molecules with a polar head and a long nonpolar hydrocarbon tail.)

- Egg yolk contains lecithins which solubilize oil in water (See Figure 12.20 of the text).
- The nonpolar oil becomes soluble in water because the nonpolar tails of lecithin dissolve in the oil, and the polar heads of the lecithin molecules dissolve in polar water (like dissolves like).