

Solubility and cleaning

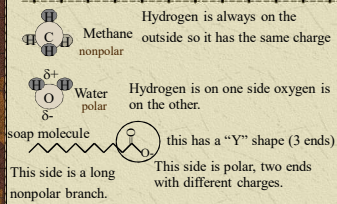
Vocabulary

- ❏ Soluble/miscible- will dissolve in a solvent
- ❏ Insoluble/immiscible- will not dissolve in a solvent
- ❏ ~Both of these terms require a solvent
- ❏ For example vitamin A is a fat soluble vitamin, meaning it will dissolve in oils (fat)
- ❏ However it is insoluble in water
- ❏ Water soluble (vitamin C) vitamins dissolve in water but are insoluble in oils.

Polarity of solvent

- ❏ molecules and compounds can either be polar or nonpolar.
- ❏ General rule- like dissolves like
- ❏ polar dissolves polar; nonpolar dissolves in nonpolar.

Both polar and nonpolar



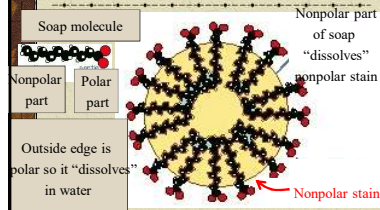
Cleaning

- ❏ Washing is normally dissolving the "stain" material.
- ❏ Hard stains to get out are usually nonpolar.
- ❏ Dry cleaners use a nonpolar solvent (that is a liquid) that doesn't harm most materials (tetrachloroethene)
- ❏ Soap is both polar and nonpolar.

Soap

- ❏ The nonpolar "tail" sticks in the stain, dissolving it.
- ❏ Leaving the polar "head" exposed.
- ❏ Many more soap molecules do this.
- ❏ This is called a soap micelle.
- ❏ So water encounters a sphere of nonpolar material with a polar "coating" on it (micelle).
- ❏ the water picks up the "polar" sphere and sweeps it away.

Soap Micelle



Polar stains

- ❏ Water cleans polar stains itself.
- ❏ Soap's polar side does not clean polar stains.
- ❏ Soap only works in conjunction with water.
- ❏ The soap must be dissolved in the water to dissolve a nonpolar stain.

Emulsions

- ❏ This creates an emulsion (colloidal suspension of liquids)
- ❏ Mayonnaise is another emulsion.
- ❏ Mayonnaise is made up oil and vinegar (and other things) but an emulsifier allows them to mix in a colloidal suspension.

More on Soap

- ❖ Your body naturally secretes oil (sebum)
- ❖ This oil can cover a polar stain and make it difficult to clean off.
- ❖ Soap is very good at dissolving the oil off your skin, so you can clean what is underneath.

Detergents

- ❖ Soaps are made from naturally occurring fats and sodium hydroxide.
- ❖ Detergents are made from mixing crude oil products or synthetic oils and sodium hydroxide.
- ❖ Detergents came into heavy use during World War II when oils were in short supply.

Which is better?

- ❖ Soap will react with some ions in "hard water", water with heavy metal ions, to form an insoluble film ~soap scum
- ❖ Detergents will not.
- ❖ Soaps tend to be better for the environment (more biodegradable)
- ❖ Soaps tend to be less harsh on your skin
- ❖ We use detergents for nonliving things, and soap for bathing.

Hand sanitizer (Purell) vs. soap

- ❖ The purpose of soap is to help you remove stain material.
- ❖ Hand sanitizer is an alcohol based antiseptic.
- ❖ The purpose is to kill any bacteria present.
- ❖ The remains of the bacteria are still there.
- ❖ In a chemistry room, we need to remove any chemical that may irritate your skin. Therefore you should wash with soap and water after a lab

Solubility

- ❖ ~A measure of how soluble something is.
- ❖ Nothing is completely soluble or completely insoluble.
- ❖ Increasing the temperature normally increases the amount of a solid solute a solution can hold.

Gases dissolved in a liquid

- ❖ Colder solutions hold more of a gaseous solute.
- ❖ Heating a solution forces gases to come out of solution (pre-boiling bubbles)
- ❖ Higher pressure solutions can hold more gases.
- ❖ ~Why a pop can fizzes when opened

Decompression Sickness

- ❖ If you dive deep into the ocean (submarine or scuba) the pressure increases
- ❖ More gases will dissolve in the fluids of your body
- ❖ If you rise too quickly, gases dissolved in the fluids of your body will come out of solution
- ❖ This painful and deadly situation is called decompression sickness or "the bends"

Saturation

- ❖ Saturated solution- solution that has all the solute it can hold. If any more is added it will not dissolve.
- ❖ Supersaturated solution- a soln. holding more solute than it should
- ❖ Made by heating a solution to dissolve more solute and then cooling it.
- ❖ If you disturb a supersaturated solution the solute will fall out of solution.

Solubility Curve

Graph of grams of solute vs. temperature

