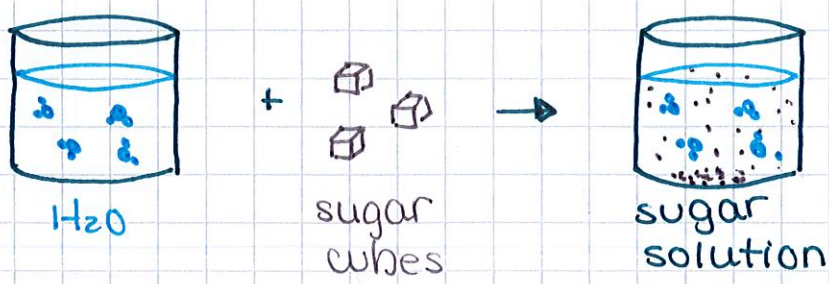
Solubility

the ability to dissolve



solvent
substance that does the dissolving

solute
substance that gets dissolved

solution
homogeneous mixture of 2 or more substances

- Only certain solutes dissolve in certain solvents

"like dissolves like"

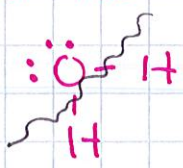
Polar solvents dissolve polar solutes

1) All ionic compounds are polar

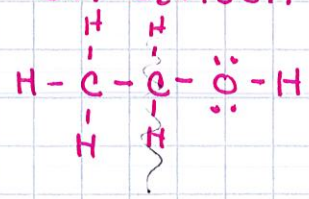
Ex) NaCl - metal + nonmetal
$NaCl_{(aq)} \rightarrow Na^{1+}_{(aq)} + Cl^{1-}_{(aq)}$

2.) Polar molecules are polar. 1 side of the molecule is different from the other side

Ex) H_2O



Ex) C_2H_5OH

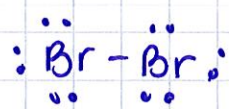


↳ It's polar if there are lone pairs on the center atom

Nonpolar solvents dissolve nonpolar solutes

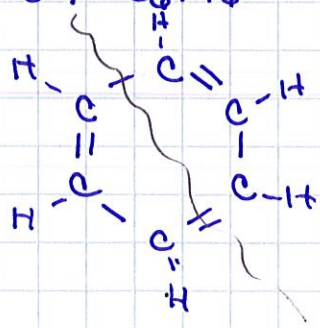
1) Pure covalent molecules are nonpolar

Ex) Br_2

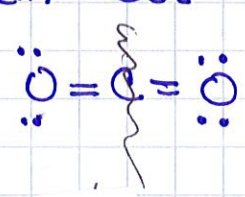


2) molecules that do NOT have 1 side different from the other

Ex) C_6H_6



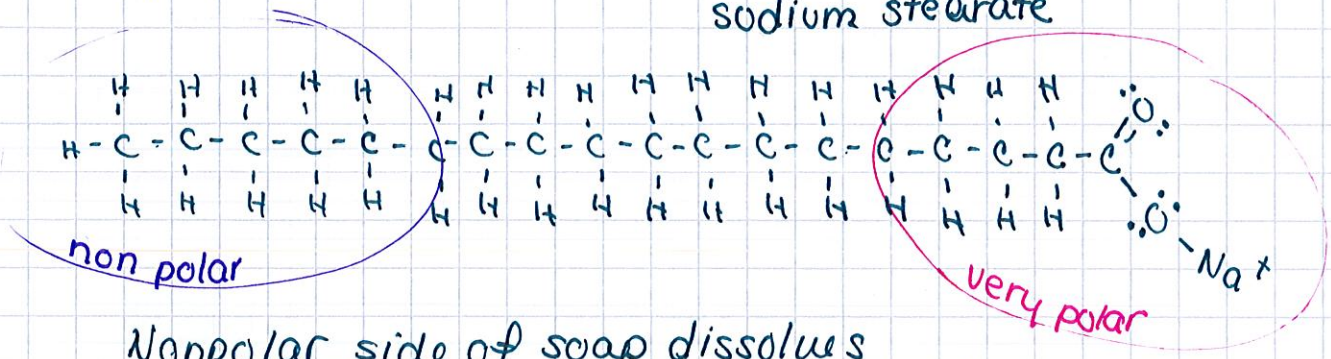
Ex) CO_2



(1) What is the best way to get clean?
(Hint: dirt is nonpolar)

w/ only H_2O?
polar

or w/ soap & H_2O?
↓
sodium stearate



Nonpolar side of soap dissolves the dirt & the polar side dissolves in water, dragging the dirt down the drain

(2) Why is it never a good idea to take too many vitamins?

water soluble (polar) vitamins	fat soluble (nonpolar) vitamins
B & C	A, D, E, & K
cannot take too much of these, your body gets rid of the extra	can overdose on these and get sick or die

- Factors Affecting Solvation (dissolving)

(1) agitation (stirring) - dissolves solutes faster
why? solute & solvent molecules collide more often

(2) surface area - increasing surface are dissolves solutes faster (break into smaller pieces)
why? more solute avaible to dissolve in the solvent

(3) Temperature

Solids - higher temps dissolve solutes faster why? higher KE, molecules faster, & collide more often

Gases - lower temps. dissolve gases better why? lower KE & move slower to stay dissolved in the liquid.

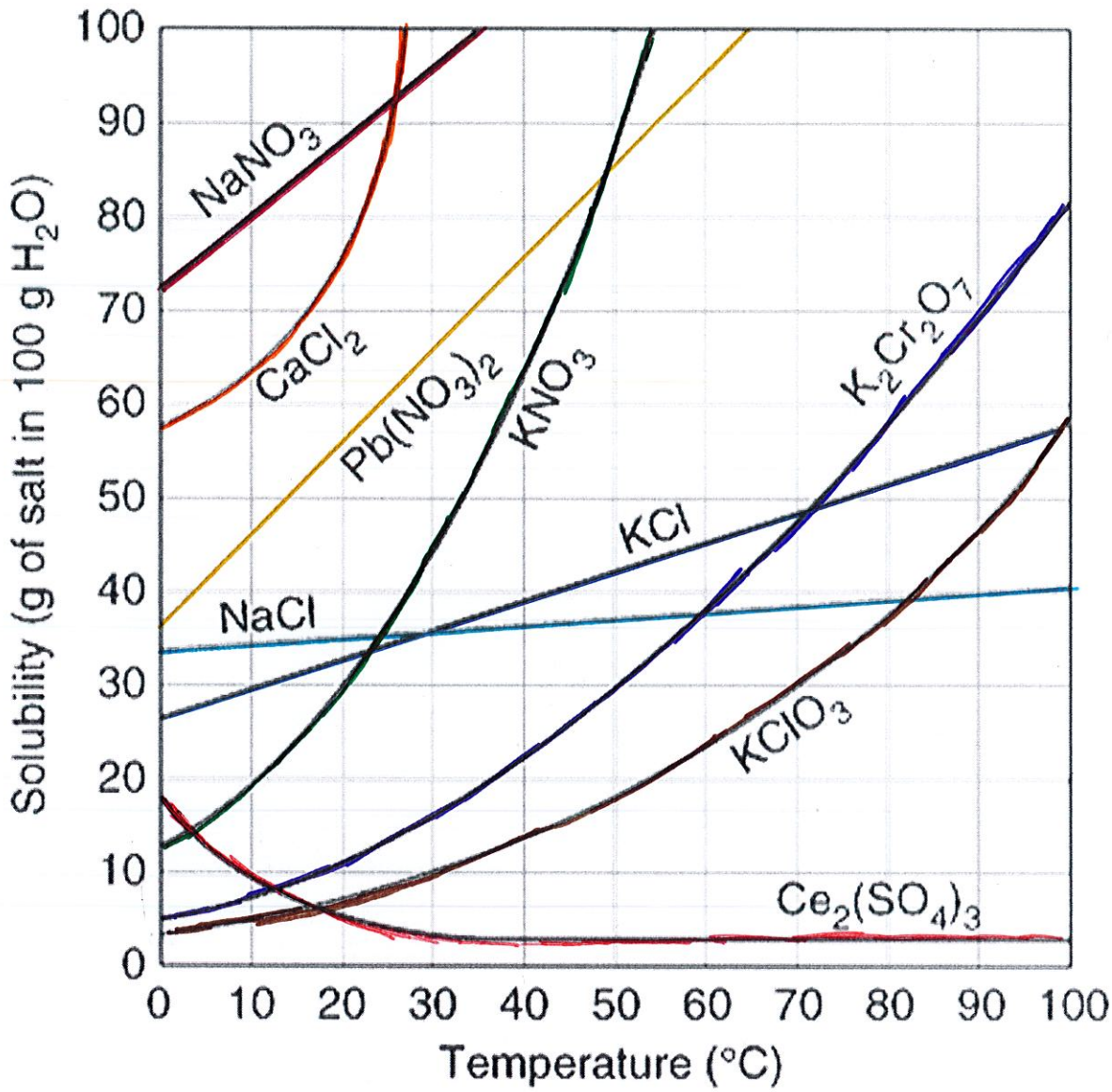
Solubility Graph

- show the amount of solute that can dissolve in a specific amount of solvent at specific temperature to create a SATURATED solution

UNSATURATED
less than the maximum amount of solute has dissolved

↓
maximum amount of solute has dissolved

supersaturated
more than the maximum amount of solute is dissolved - very unstable - crystallizes if disturbed



Ex) Determine if the solution is unsat., sat. or supersat. under these conditions:

1) dissolve 20.g NaCl at 30°C. unsat.
2) dissolve 8g of $Ce_2(SO_4)_3$ at 40°C. supersat.
3) dissolve 45g of $KClO_3$ at 60°C. supersat.

4) What mass of potassium dichromate is needed to make a saturated solution in 100g of water at 40°C? ~22g

5) What temperature do you need to make a saturated solution of 75.0g $Pb(NO_3)_2$ in 100g H_2O? 40°C

6) How much $CaCl_2$ is needed to dissolve in 300g H_2O at 25°C? We know $\frac{90g\ CaCl_2}{100g\ H_2O} \times 3 = \frac{270g\ CaCl_2}{300g\ H_2O}$