$C_6H_5CH_3$ C=7 H=8 Ben C=6 H=6

111g To

111g To + 261 ben

$$\frac{111g\ To \times \frac{1}{92}}{111g\ To \times \frac{1}{92} + \frac{1}{78} \times 261} \qquad \frac{1.2065217391}{4.552676585}$$

Quiz

1. Henry's Law
C. $P_{solute} = K_H X_{solute}$ Increase VP of gas solute above solution Increase gas in solution.
2. Like dissolves like means 2 substances that have similar ___ are likely to form a solution.
E. IMF.
3. For most mixtures that form homogeneous solutions $\Delta H_{solution}$ is
B. Small (near 0) & positive. $\Delta H_{solution} = \Delta H_{lattice\ energy} + \Delta H_{solution}$ (+ and −)

Ideal solution then would be about same. Reality about the same.

Talk about T dependence of solute

Solubility ↑ with Temp.

$\Delta G = \Delta H - T\Delta S$

more ↓ free energy of solution is lower

Increase T

Increase $T\Delta S$ term

gets bigger drives to greater solubility.

Solubility ↑

Temp. →

POLL

Do you think $\Delta H_{solution}$ for a gas is

(B) Negative.

exothermic reaction → temp ↑, solubility ↓

$\Delta H_{solution} = \Delta H_{lattice} + \Delta H_{solvation}$

$\Delta H_{solution} < 0$.

$-\Delta G$ = spontaneous
$+\Delta G$ = not spontaneous

In reality things always dissolve just a little tiny bit. The question is magnitude of ΔG. The bigger a negative #, the bigger solubility.

Poll 2 Mixing two liquids and we say Miscible.

Misicible capable of being mixed

immisicible not capable of being mixed.

Which is most likely to be misicible with water?

(a) Methanol CH_3OH small nonpolar → polar

b. butanol C_4H_9OH

c. Octanol

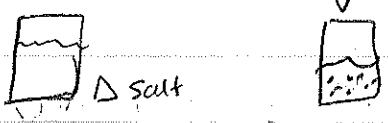
d. didodecanol

polar ⇒ hydrophillic

nonpolar ⇒ hydrophibic.

Poll 3 water + salt → Salt water

which has higer entropy? → The solution.



All solutions is positive change.

Change is Final - Initial.

Which has higher entalpy?

(C) They are about the same. - b/c $\Delta H_{solution}$ is ~0 the 2 entalpies must be nearly the same.

Which has lower "free energy"?

(b) The solution $\Delta G = \Delta H - T\Delta S$

$G_F - G_i = (-)$

↑ Lower energy.

When we make a solution enthalpy is ~ Ø

↓

is Entropy ↑

↓

therefore free energy ↓

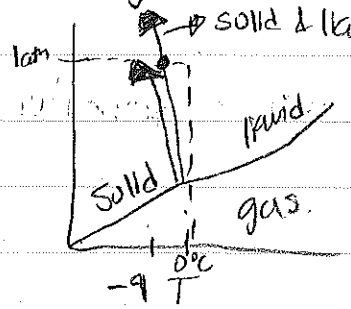
↓

therefore it is more stable than pure liquid

The water and ice = 0°C

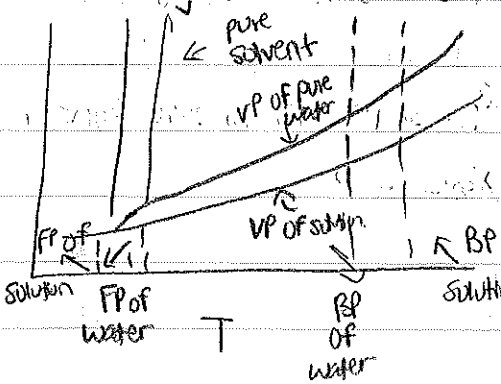
The water + ice + salt = -9°C.

As long as we have ice & water the temp will stay the same.



at specific temp & pressure a phase is most stable or has lowest free energy.

Boiling Point of Solutions.



← Solution

BP = temp @ which VP equals the external pressure.

- The more you dissolve in, the bigger effect.
- It depends on the amount you put in.

9:30 - 11 1 hr and half
11 - 12:30 1 hr and half
12:30 - 2 4 hr & half

1.5
1.5

↑ Solute = ↓ ΔG = ↑ Stability range = ↓ T

VP of solution is lower.

Effect of making the solution.

BP ↑ More stable than vapor

FP ↓ More stable than vapor.

Colligative properties depend on how much solute is added.

Poll
Which would have lowest FP?

A 2 M sugar solution 2M
B 0.5M NaCl solution 1 M : .5 M Na^+, .5 M Cl^- = 1 M
C 1 M NaCl solution 2M : 1M Na^+, 1M Cl^- = 2M
(D) 1M $MgCl_2$ solution 3M : 1M Mg, 2M Cl^- = 3M
1 $MgCl_2$ 2 Cl^-

Van't Hoff Factor i

Colligitative properties depend on concentration of solute not type of solute.

i = # of ions in formula unit.

Calculate the properties.

BP Elevation $\Delta T = iK_b M_{solute}$ (molal = Moles solute / kg solvent)

FP Depression $\Delta T = -iK_f M_{solute}$

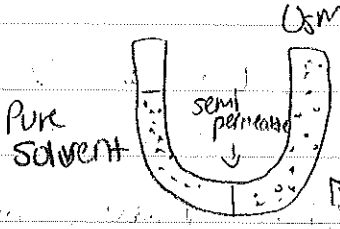
ΔVP : $\Delta P = -X_{solute} P^\circ$ (VP of pure solvent)

$P_{solution}$ $X_{solvent}$ P

Raoult's Law. ↑ VP of solution.

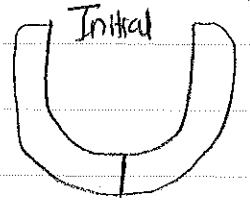
POLL Which side has lower free energy.?

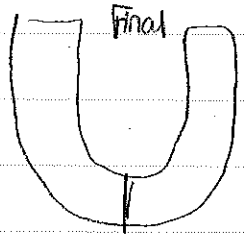
The solution.



Solvent can pass through the membrane but the solute can't pass through.

* The solution → is the lower free energy. * Always.





only solvent can move and pass through membrane.

pressure diff will depend on concentration solution.

The solvent will move to the solution side to lower free energy.

- The pressure needed to stop the flow of solvent is the osmotic pressure of that solution.
- Osmotic Pressure = $\Pi = iMRT$ → (K) ← gas constant $\frac{L \cdot atm}{mol \cdot K}$
  ↓ Molar concentration.

POll What will happen to following cell when placed in beaker?

B. The cell will expand.

0.1 M.

Cell 0.3M.

Free energy inside cell is lower.

Water flow from low concentration to higher concentration.

Isotonic cell - Its the same.

hypertonic cell - concentration of solution > cell

hypotonic cell - the concentration of solution, < cell

Will osmosis stop? Yes

→ concentration will equal osmosis is water flow

water flow continuous dynamic equilibrium