Answer on question #60752 – Chemistry – Physical Chemistry

Question:

Why is concentration multiplied to number of moles?

$$A_xB_y \rightleftharpoons xA^{y+} + yB^{x-}$$

	A_xB_y	A^{y+}	B^{x-}
initial concentration	C	0	0
concentration at equilibrium	$C(1-\alpha)$	$Cx\alpha$	$Cy\alpha$

$$\begin{aligned}\text{total number of moles at equilibrium} &= Cx\alpha + Cy\alpha + C(1-\alpha)\\ &= C[1-\alpha+x\alpha+y\alpha]\\ &= C[1+\alpha(x+y-1)]\end{aligned}$$

Answer:

X or Y here are not the number of moles. They are coefficients in the equation of dissotiation

For example $BaCl_2$->Ba^{2+}+2Cl^-

From 1 mol of $BaCl_2$ 2 mol of Cl^- is produced.

If concentration $BaCl_2$ is 1 mol/l (or C), then concentration of Cl^- is 2 mol/l (or 2C)

For AxBy – concentration of A^{y+} is C*x, concentration of B^{x-} is C*y

But this example is correct if dissiociation of electrolyte is complete. (arrow -> in equation)

But if the dissociation of electrolyte is not complete, we can use parameter α – degree of dissociation.

Degree of dissociation is the fraction of a mole of the reactant that underwent dissociation

For example, imagine that $BaCl_2$ is not dissociated completely and degree of dissotiation is 50%.

$BaCl_2 \leftrightarrow Ba^{2+}+2Cl^-$

From 1 mol of $BaCl_2$ only 0,5 mol (α*C) is dissociated.

As result 1 mol of Cl^- is produced (or 2*α*C)

For AxBy – concentration of A^{y+} is C*x* α, concentration of B^{x-} is C*y* α