LCXLC Homework

1.State the product rule for peak capacity. What adjustment factors account for the lower than expected peak capacity?

product rule:

$$n_{c,\,tot} = {}^{1}n_c \times {}^{2}n_c$$

α-undersampling, γ-peak broadening, f-orthogonality

2. What is under-sampling of the first column and how does it reduce the overall peak capacity?

–Transfer of fractions from 1^{st}→2^{nd}-dimension. Sampling steps between columns depends on the number fractions. 1D undersampling results in loss of peak capacity in the 1^{st}-dimension.

3. How are fractions from the first column loaded onto the second column?

-Using a switching valve, fractions are collected in a sample loop and injected onto the 2^{nd} column.

4. What must be added to the one-dimensional HPLC to achieve LCxLC?

-A second pump, a second column, valve-switching systems to move between dimensions. (Optional 2^{nd} detector if desired.)

5. Why must the second column processing time be must faster than the first?

-The 2nd column processing time must be much faster then the 1st because the fraction of analytes that are injected onto the 2nd dimension column must be analyzed quickly before the following fraction(s) are injected, this continues in series.

6. List 3 Advantages and disadvantages (not including cost, $) for LCxLC?

-**Advantages:**

1. Resolution of complex samples
2. Higher peak capacity (product rule)
3. Easily interpretable chromatograms
4. Improved separation
5. Resolving power

-Disadvantages:

1. Slow analysis time
2. Limited optimization tools
3. Mobile phase compatibility
4. Software (improving always)