β-carotene (aq) ⇌ β-carotene (CH_2Cl_2) $K = 10$

Assume 100 mL of aqueous phase.

Say we can use 100 mL of CH_2Cl_2 for extraction

(1) 1 100-mL extraction

$$q = \frac{100\ mL}{100\ mL + 10(100\ mL)} = 0.09 =$$ **9% remaining in aq phase**

(2) 4 25-mL extractions

$$q^4 = \left(\frac{100\ mL}{100\ mL + 10(25mL)}\right)^4 = 0.007 =$$ **0.7% remaining in aq phase**

(3) 100 1-mL extractions

$$q^{100} = \left(\frac{100mL}{100\ mL + 10(1\ mL)}\right)^{100} = 7 \times 10^{-5} =$$ **0.007% remaining in aq phase**

* Key is the chance to re-equilibrate with pure CH_2Cl_2 with each successive extraction