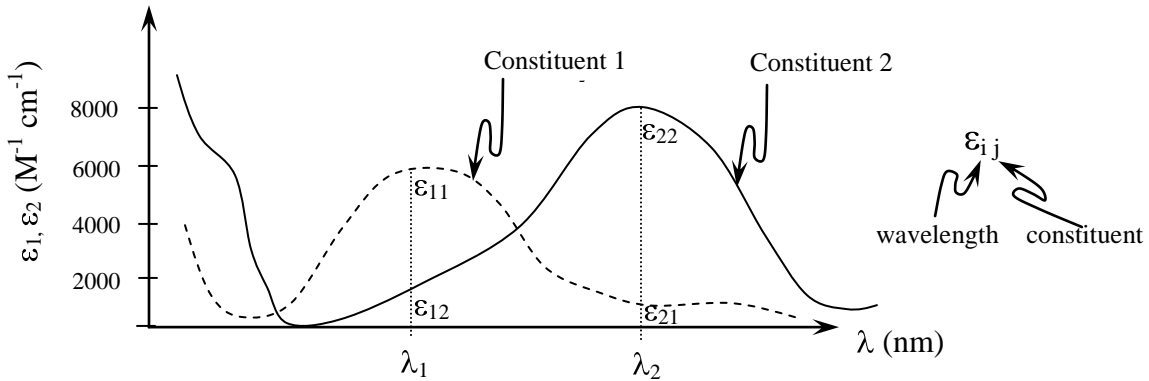


Absorbance of Mixtures



$$A_\lambda = \epsilon_{\lambda 1} \ell c_1 + \epsilon_{\lambda 2} \ell c_2$$

$$A_1 = \epsilon_{11} \ell c_1 + \epsilon_{12} \ell c_2 \quad \leftarrow \text{for } \lambda_1$$

$$A_2 = \epsilon_{21} \ell c_1 + \epsilon_{22} \ell c_2 \quad \leftarrow \text{for } \lambda_2$$

$$\begin{array}{c} \text{constituent 1} \quad \text{constituent 2} \\ \downarrow \quad \downarrow \\ \begin{pmatrix} A_1 \\ A_2 \end{pmatrix} = \begin{pmatrix} \epsilon_{11} & \epsilon_{12} \\ \epsilon_{21} & \epsilon_{22} \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} \end{array} \quad \begin{array}{l} \leftarrow \lambda_1 \\ \leftarrow \lambda_2 \end{array} \quad (\ell = 1 \text{ cm})$$

$$\tilde{A} = \begin{pmatrix} A_1 \\ A_2 \end{pmatrix} \quad \text{and} \quad \tilde{c} = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix}$$

$$\tilde{\xi} = \begin{pmatrix} \epsilon_{11} & \epsilon_{12} \\ \epsilon_{21} & \epsilon_{22} \end{pmatrix} \quad \tilde{A} = \tilde{\xi} \tilde{c} \quad (\ell = 1 \text{ cm})$$

$$\begin{array}{c} \text{column 1} \quad \text{column 2} \\ \downarrow \quad \downarrow \\ \text{row 1} \rightarrow \left(\begin{array}{cc} \epsilon_{11} & \epsilon_{12} \end{array} \right) \\ \text{row 2} \rightarrow \left(\begin{array}{cc} \epsilon_{21} & \epsilon_{22} \end{array} \right) \end{array} \quad \tilde{\xi} = \begin{pmatrix} \epsilon_{11} & \epsilon_{12} \\ \epsilon_{21} & \epsilon_{22} \end{pmatrix} = \begin{pmatrix} 6000 & 1800 \\ 1000 & 8000 \end{pmatrix}$$

Let $c_1 = 2.54 \times 10^{-5} \text{ M}$ and $c_2 = 0.86 \times 10^{-5} \text{ M}$. What are the absorbances?

$$\tilde{A} = \tilde{\xi} \tilde{c} = \begin{pmatrix} \epsilon_{11} & \epsilon_{12} \\ \epsilon_{21} & \epsilon_{22} \end{pmatrix} \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} = \begin{pmatrix} 6000 & 1800 \\ 1000 & 8000 \end{pmatrix} \begin{pmatrix} 2.54 \times 10^{-5} \text{ M} \\ 0.86 \times 10^{-5} \text{ M} \end{pmatrix} =$$

$$\begin{pmatrix} A_1 \\ A_2 \end{pmatrix} = \begin{pmatrix} 6000(2.54 \times 10^{-5}) + 1800(0.86 \times 10^{-5}) \\ 1000(2.54 \times 10^{-5}) + 8000(0.86 \times 10^{-5}) \end{pmatrix} = \begin{pmatrix} 0.168 \\ 0.094 \end{pmatrix}$$

$$\tilde{\xi}^{-1} \tilde{A} = \tilde{c} \quad (\ell = 1 \text{ cm})$$

$$(\tilde{\xi}^\ell)^{-1} \tilde{A} = \tilde{c}$$

