The absorption cross section, σ_A

The absorption cross section has units of area (cm^2).
It gives a probability for absorption. We have discussed the probability in terms of the transition dipole moment. M_{12} and shape in terms of the Franck-Condon factor, FC.

$$\sigma_A(\omega) \propto |M_{12}|^2 FC(\omega)$$

The absorption cross section is proportional to the well known extinction coefficient.

$$\epsilon(\omega) = \frac{\sigma_A(\omega) N_A}{1000}$$

The extinction coefficient has units of $M^{-1}cm^{-1}$.

Beer-Lambert Law

$$I = I_0 \, 10^{-A}$$

$$A(\nu) = \epsilon(\nu) c d$$

A is the absorbance.
ε(n) is the extinction coefficient.
The unit of ε(n) is $M^{-1}cm^{-1}$.
C is the concentration (M).
d is the pathlength (cm).
The exponential attenuation of the intensity is shown in the Figure.