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# quantum yield, $\Phi$

Number of defined events occurring per photon absorbed by the system.
The integral quantum yield is

$$\Phi(\lambda) = \frac{\text{number of events}}{\text{number of photons absorbed}}$$

For a photochemical reaction,

$$\Phi(\lambda) = \frac{\text{amount of reactant consumed or product formed}}{\text{amount of photons absorbed}}$$

The differential quantum yield is

$$\Phi(\lambda) = \frac{\mathrm{d}x / \mathrm{d}t}{q_{n,\mathrm{p}}^{0}\,[1 - 10^{-A(\lambda)}]}$$

where $\mathrm{d}x / \mathrm{d}t$ is the rate of change of a measurable quantity (spectral or any other property), and $q_{n,\mathrm{p}}^{0}$ the amount of photons (mol or its equivalent einstein) incident (prior to absorption) per time interval (photon flux, amount basis). $A(\lambda)$ is the absorbance at the excitation wavelength.

Notes:

1. Strictly, the term quantum yield applies only for monochromatic excitation. Thus, for the differential quantum yield, the absorbed spectral photon flux density (number basis or amount basis) should be used in the denominator of the equation above when $x$ is either the number concentration ($C = N / V$), or the amount concentration ($c$), respectively.
2. $\Phi$ can be used for photophysical processes (such as, e.g., intersystem crossing, fluorescence and phosphorescence) or photochemical reactions.

***Source:***
PAC, 2007, *79*, 293 *(Glossary of terms used in photochemistry, 3rd edition (IUPAC Recommendations 2006))* on page 406

 