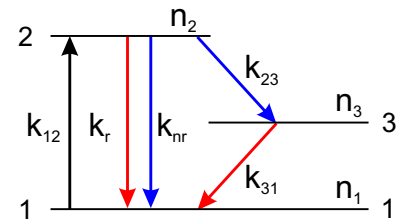


Exercises (V)

(Discussion is on Friday, 16.12.2022)

Problem 1:

In the lecture a simplified solution for the emission rate R_{em} of molecules was discussed which was based on three states of different energy (ground- singlet-, and triplet state). Establish the differential equations for the rates between these states and derive the steady state solution for the photon emission rate $R_{\text{em}} = k_r n_2$ for the 'allowed' transition from the singlet state (population number n_2) to the ground state (population number n_1) as a function of the excitation intensity I and the rate constants k_{23} , k_{31} , k_r , and k_{nr} (see figure and lecture notes).



Note: The excitation intensity I of light can be expressed as $I = \frac{h\nu}{\sigma} k_{12}$ with photon energy $h\nu$, absorption cross section σ , and absorption rate constant k_{12} .