

PHOTOLUMINESCENCE SPECTROSCOPY

SDSU CHEM 251

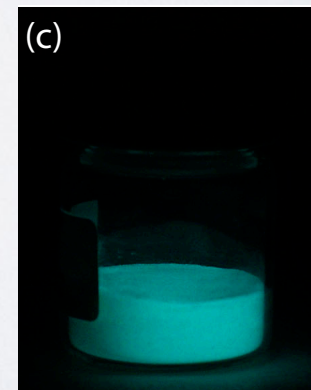
PHOTOLUMINESCENCE

- Photoluminescence spectroscopy is divided into two categories: **fluorescence** and **phosphorescence**.
- Both are modes of emission of light by molecules, however fluorescence happens very rapidly after excitation, while phosphorescence takes much longer.

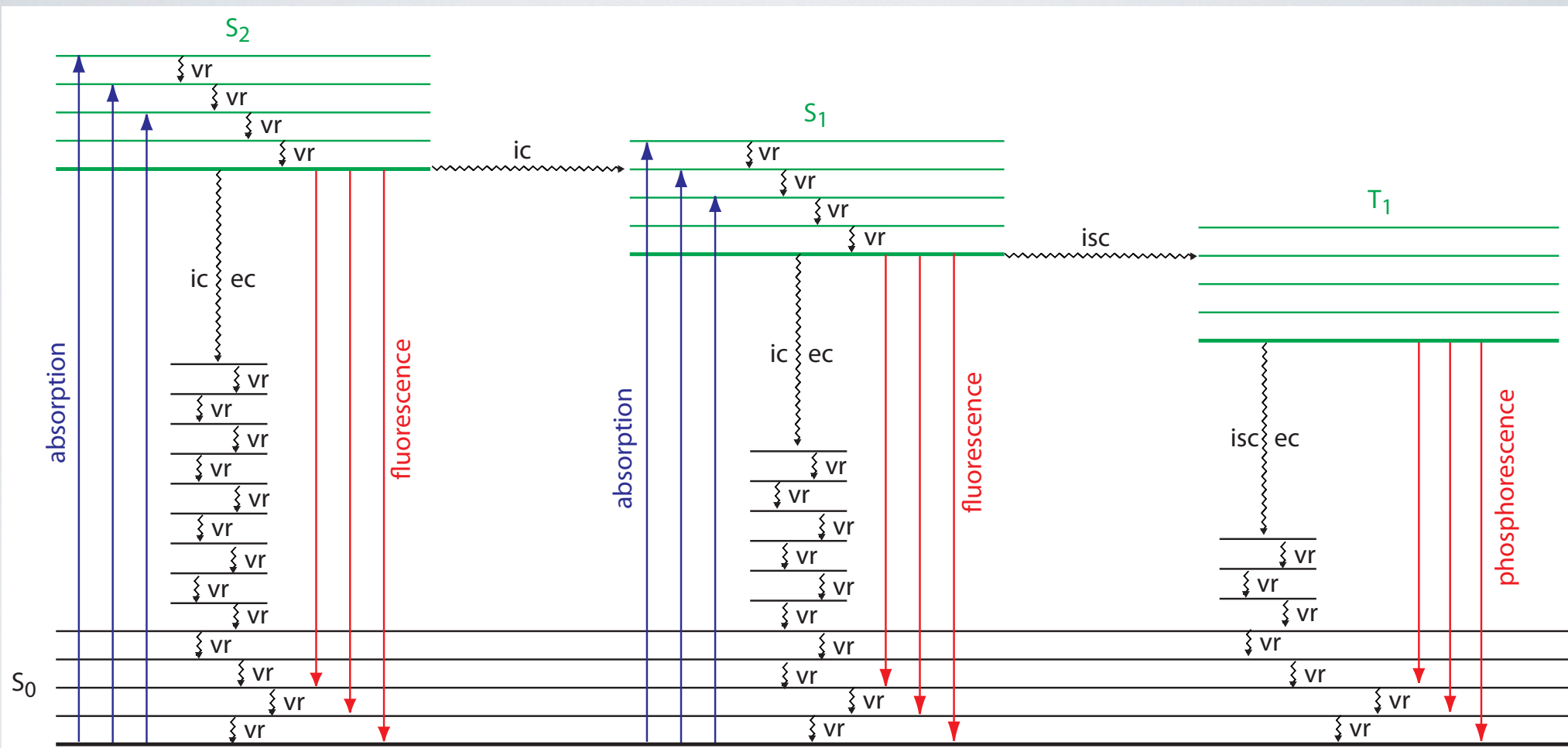
Fluorescence



Phosphorescence



FLUORESCENCE VS PHOSPHORESCENCE



vr: vibrational relaxation

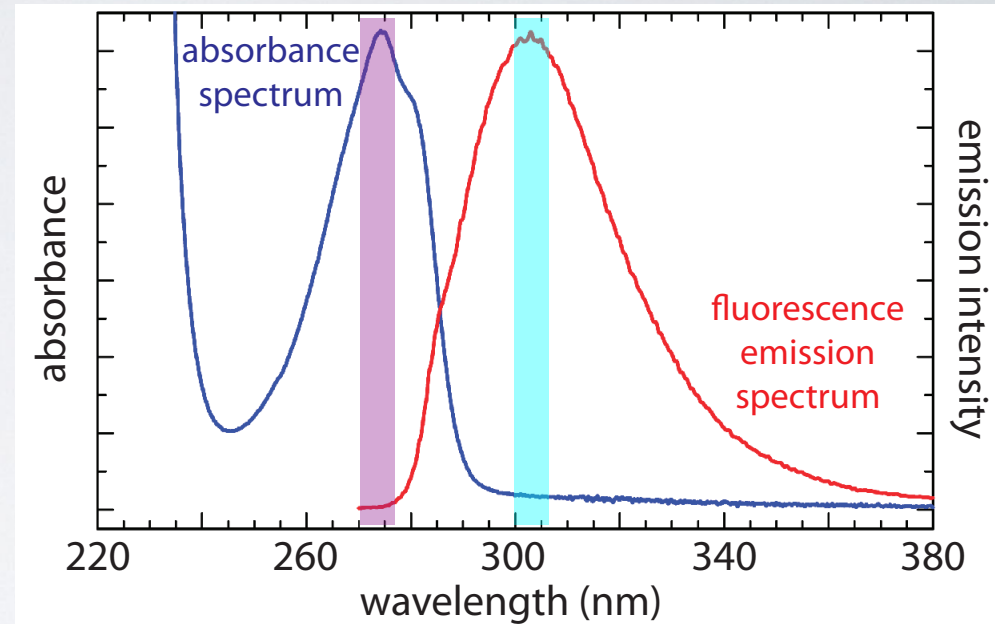
ic: internal conversion

ec: external conversion

isc: intersystem crossing

FLUORESCENCE

- Typically fluorescent compounds are excited with lasers to minimize the amount of extra wavelengths of light.
- Excite at shorter wavelengths (e.g. 275 nm) and measure at longer wavelengths (e.g. 310 nm).
- Emission intensity (I_f) is dependent on excitation power (P_o)

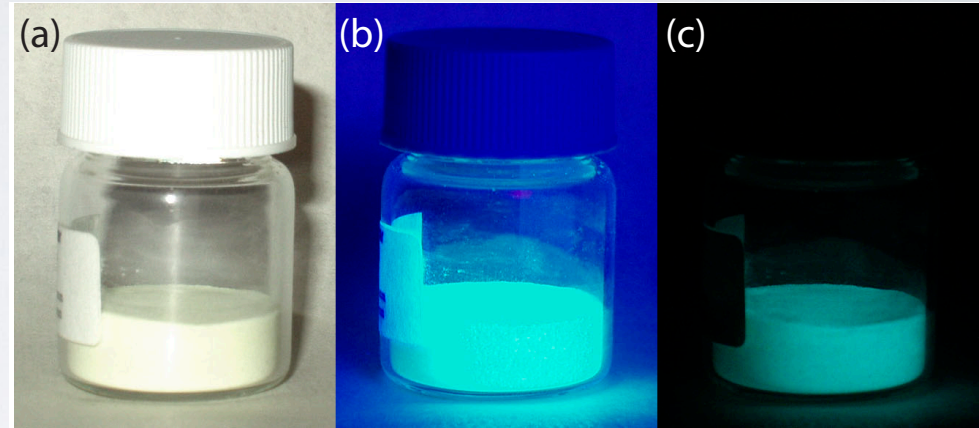


$$I_f = k\Phi_f P_o (1 - 10^{-\epsilon b C})$$

Φ_f : fluorescent quantum yield (percentage of photons emitted compared to the number absorbed), between 0 and 1.

PHOSPHORESCENCE

- Because phosphorescent photorelaxation takes **longer** than fluorescence, phosphorescence continues after the excitation source is gone (**glow in the dark**).
- Relatively few compounds are phosphorescent so it is not as widely used for quantitative analysis.



$$I_p = 2.303k\Phi_p \epsilon b C P_o$$