Sim Pack 1:

Fluorescence

Version 1.0

Learning Outcomes:

After reading these notes you will learn about the following terms

- **Luminescence (fluorescence & phosphorescence)**
- **Steady state spectroscopy**
- **Fluorescence quantum yield**
- **Fluorescence excited state lifetime**

Steady State Spectrometer

Luminescence spectra (intensity of luminescence as a function of wavelength) can be produced on a steady state spectrometer as shown in Figure 2:

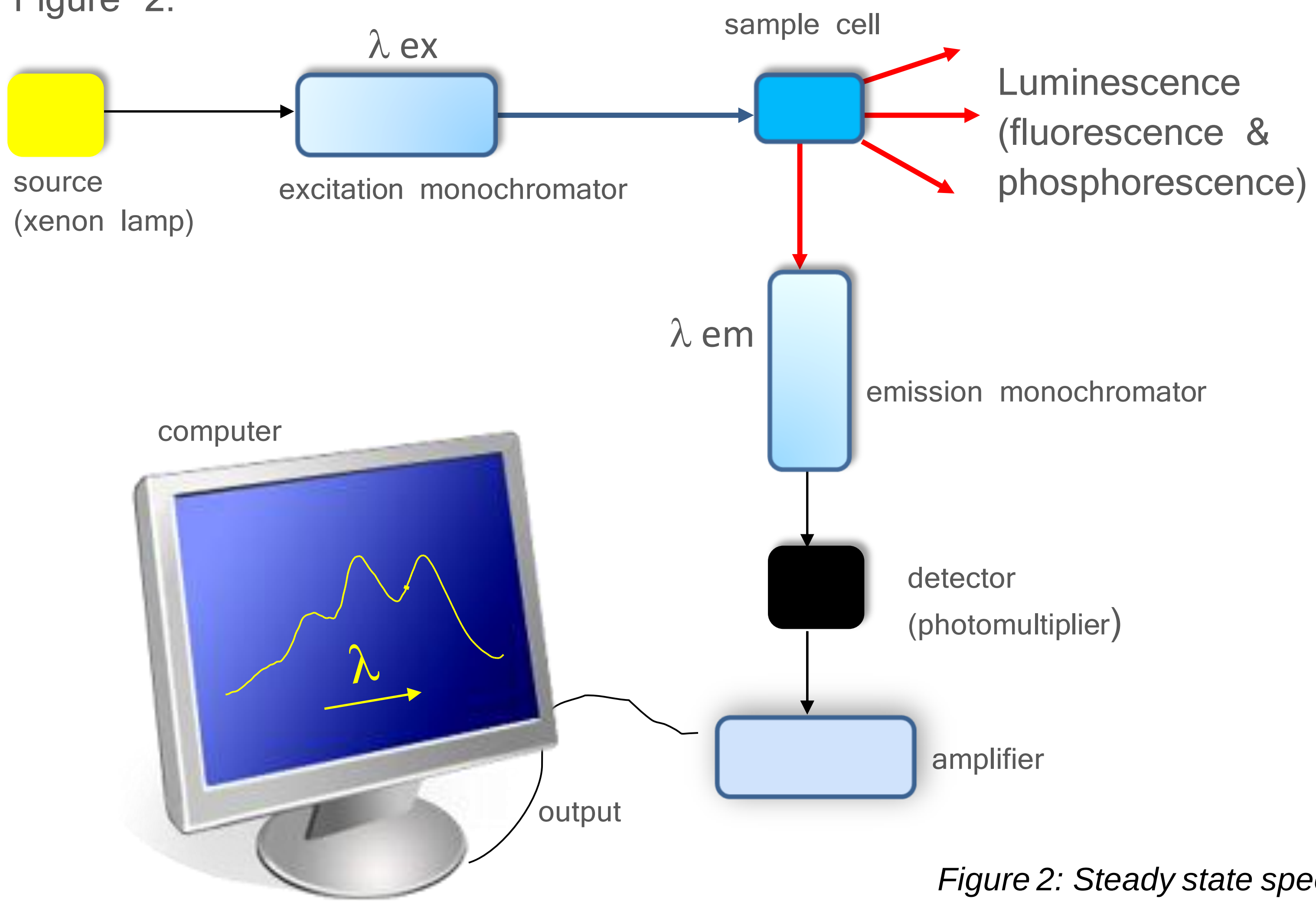


Figure 2: Steady state spectrometer

Emission Spectrum

To produce an emission spectrum the λex monochromator (see Figure 2) is held constant and the λem [or λa (a = analysis)] monochromator is scanned.

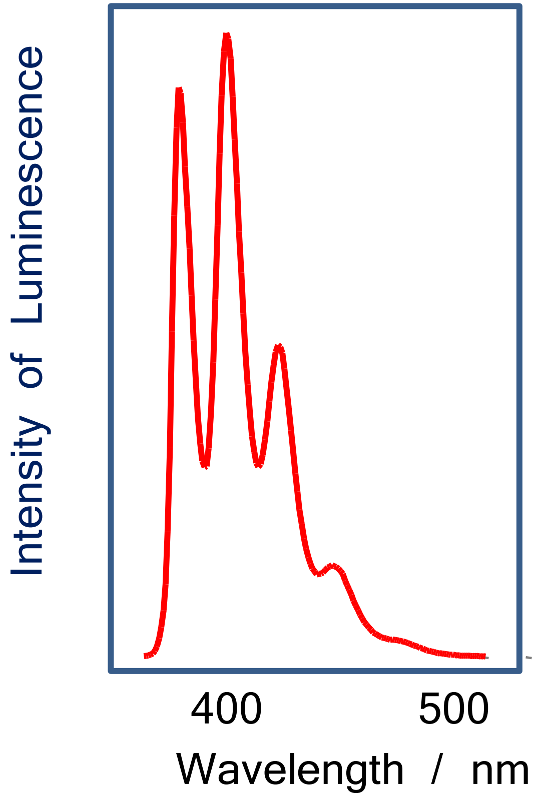


Figure 3: Steady state emission spectrum

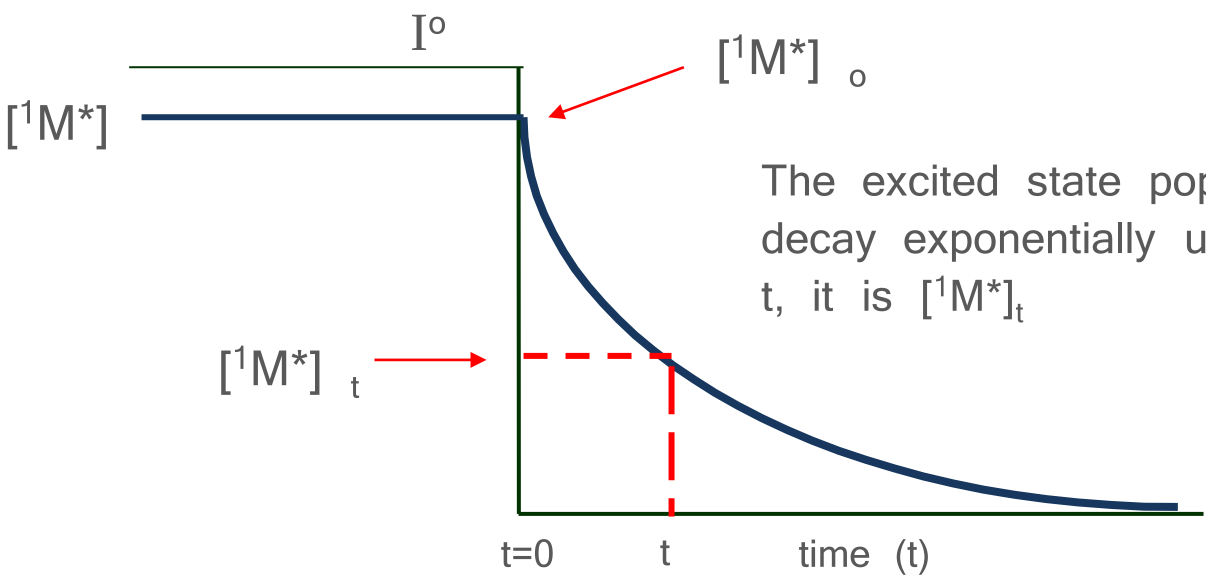
An emission spectrum is therefore the intensity of luminescence (I_L) as function of wavelength (see Figure 3).

Fluorescence Lifetime (Lifetime of the Excited State)

If we use light of intensity I_o this creates an excited state population $[^1M^*]$ (M absorbs the light to create $^1M^*$), [See Figure 6]

$[^1M^*]$ will remain constant (i.e., in a steady state) until the light is removed

At the instant light is removed the concentration of excited states is $[^1M^*]_o$



The excited state population $[^1M^*]_o$ will decay exponentially until after some time, t, it is $[^1M^*]_t$

Figure 6: decay of excited state population

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