

February 18, 2005

➤ No Class on Monday (Presidents Day)! ☹

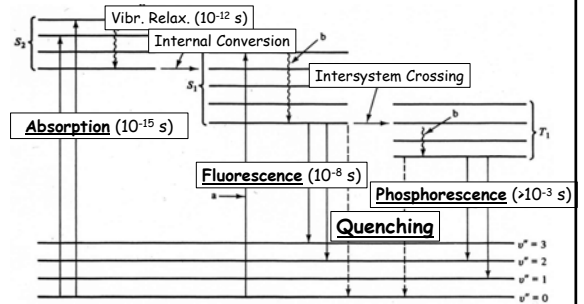
➤ Exam #1

- Solution Key will be posted soon
- Graded Exams returned next Wednesday

➤ Who Was Jablonski?

- Alexander Jablonski (1898-1980)
- "The Father of Fluorescence Spectroscopy"
- <http://micro.magnet.fsu.edu/optics/timeline/people/jablonski.html>

Jablonski Diagram

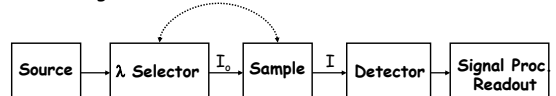


Spectroscopy: Instrumentation

Chem 221
Instrumental Analysis
Spring 2005

Spectrometer Configuration

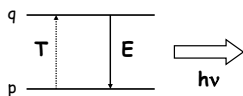
Block Diagram:



- Continuum
- Line
- Dispersive
- Non-Dispersive
- Liquids
- Gases
- Solids
- Single-Channel
- Multi-Channel

Line Sources

- Most line sources rely on *spontaneous emission* from *thermally-excited gas-phase* atoms/ions:

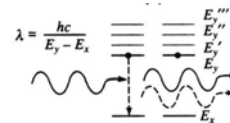


$$\text{Emission rate} = -\frac{dN_q}{dt} = N_q A_{qp}$$

Excited state population $\rightarrow N_q$
Einstein Spontaneous Emission Transition Probability $\rightarrow A_{qp}$

LASERS: The Ultimate Line Sources

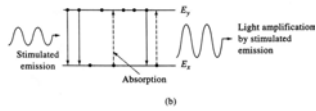
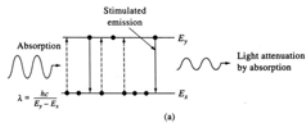
- Based on *Stimulated Emission*:



Light Amplification by Stimulated Emission of Radiation

Absorption versus Stimulated Emission

- Two processes can occur when a system is presented with EMR:



Since:

$$B_{pq}(\text{Abs}) = B_{qp}(\text{St. Em.})$$

-rates of absorption and of stimulated emission depend on the *populations of the ground* (N_p) and *excited* (N_q) states, respectively

Need: $N_q > N_p$
(population inversion) . .

Impossible! (with just 2 states)