Quiz 11.4 – Electronic Spectroscopy

Name: _____

**Electronic Term Symbols**

Give the term symbol for the excited state of $C_2$ with the following electronic configuration:

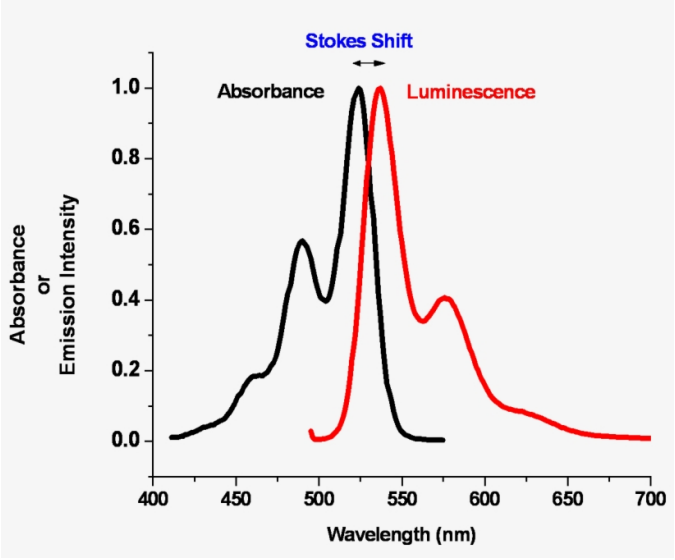
$\sigma_g(1s)^2\sigma_u^\star(1s)^2\sigma_g(2s)^2\sigma_u^\star(2s)^2\pi_u(2p)^3\sigma_g(2p)^1$

List all selection rules for electronic transitions

**Franck Condon Factors**

An electronic excitation significantly weakens and lengthens a chemical bond. Which vibrational state of the excited electronic state is likely to show the strongest transition? (Generally. I'm not looking for a particular value of $v'$)

The absorption and fluorescence spectra below show a few vibronic transitions. Give each peak a label indicating the initial and final vibrational states involved in each transition. Vibrational states of the ground electronic state should be referenced by their $v$ quantum number, and vibrational states of the excited electronic state should be referenced by their $v'$ quantum number




Next to the spectrum above, roughly sketch the potential wells and vibrational states for the electronic states involved.

**Decay Pathways**

Classify each decay pathway as *internal conversion*, *fluorescence*, *phosphorescence*, or *inter-system crossing*

- $S_1 \rightarrow T_1$ (radiationless)
- $S_1 \rightarrow S_0$ (radiative)
- $S_1 \rightarrow S_0$ (radiationless)
- $T_1 \rightarrow S_0$ (radiative)
- $T_1, v' = 6 \rightarrow T_1, v' = 0$ (radiationless)