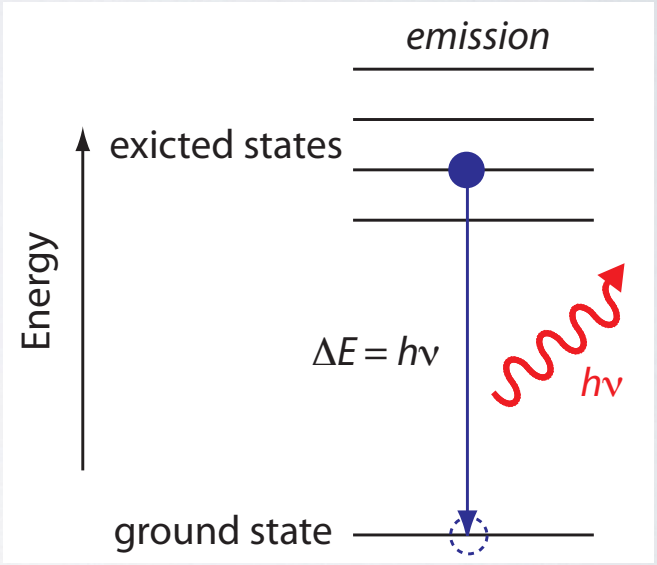
ATOMIC EMISSION SPECTROMETRY

SDSU CHEM 251

ATOMIC EMISSION

- When atoms are heated the **electrons can get excited to higher energy levels**. When these electrons relax to the ground level they may release a photon of light.

- As with absorbance, the **wavelengths** of emission will be **specific for each atom**.



ATOMIC EMISSION SPECTROSCOPY (AES)

- AES can be performed with most AAS instruments.
- The emission intensity (I_e) is proportional to the number of atoms in the excited state (***N****).
- ***N*** is the total number of atoms, g_i and g_o are the number of equivalent energy levels at the **excited** and **ground** states respectively.
- E_i is the energy of the excited level, relative to the ground level, ***T*** is the temperature of the atoms, and k is the Boltzmann constant (1.3807×10^{-23} J/K).
- Higher temperatures result in a higher percentage of the atoms in the excited state.

$$I_e = kN^*$$

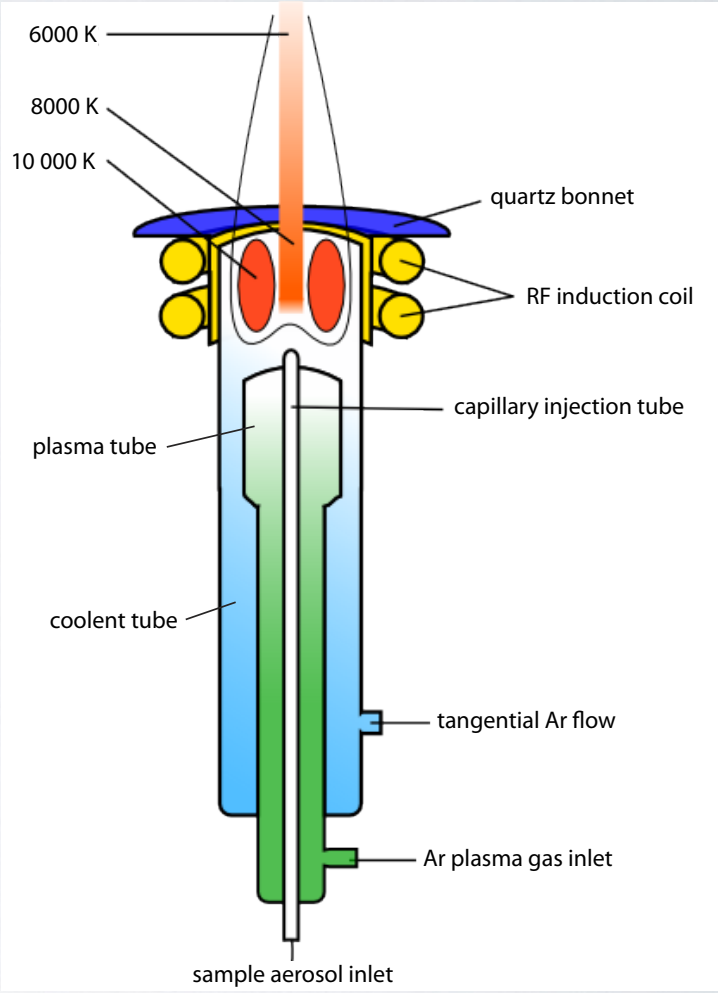
$$N^* = N\left(\frac{g_i}{g_o}\right)e^{-E_i/kT}$$

$$\frac{N^*}{N} = \left(\frac{g_i}{g_o}\right)e^{-E_i/kT}$$

INDUCTIVELY COUPLED PLASMA (ICP)

- Though flame spectrometers can perform AES, **ICP instruments are favored**.

- ICPs can achieve **much higher temperatures (10,000 K)** through the formation of an argon plasma rather than a flame.



MULTI-ELEMENTAL ANALYSIS

Unlike AAS, the **simultaneous analysis of several analytes can be done with AES**, provided their emission wavelengths can be resolved with a monochromator.