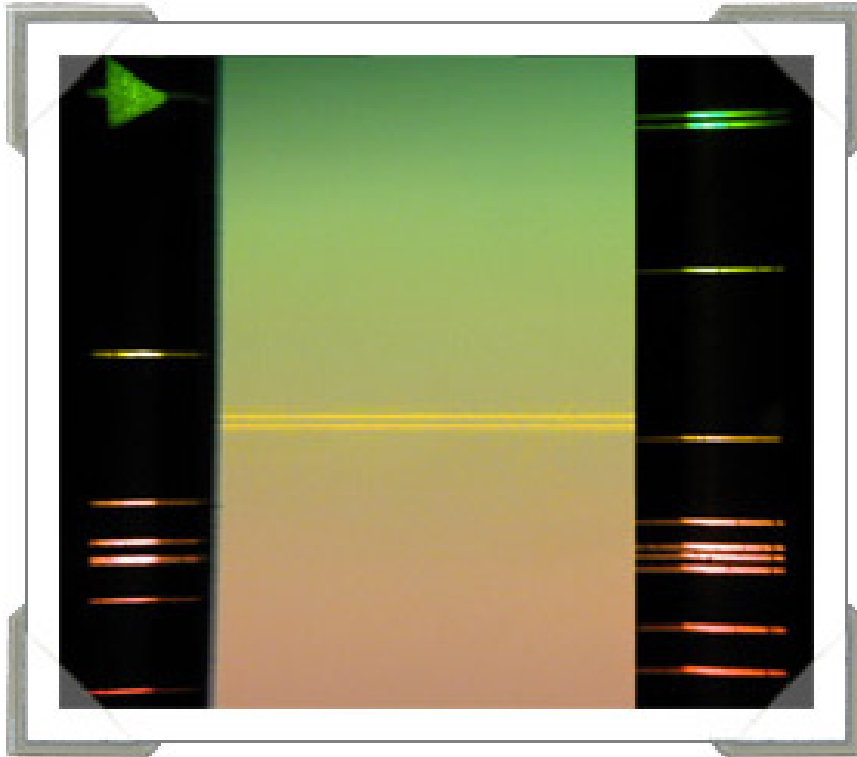


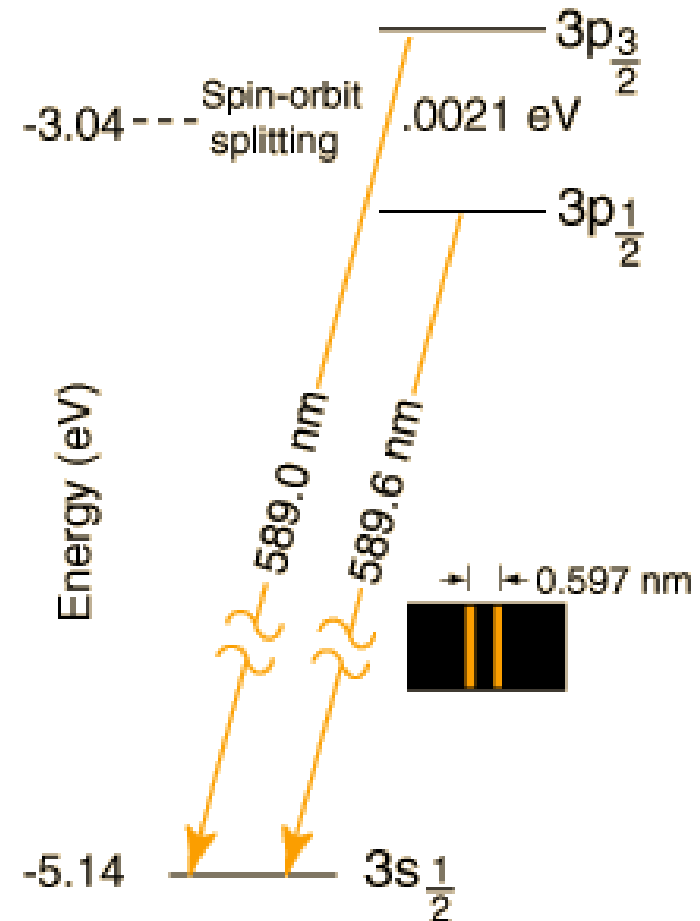
Sodium Atomic Emission Spectrum



The sodium spectrum is dominated by the bright doublet known as the Sodium D-lines at 588.9950 and 589.5924 nanometers. From the energy level diagram it can be seen that these lines are emitted in a transition from the 3p to the 3s levels. The line at 589.0 has twice the intensity of the line at 589.6 nm. Taking the range from 400-700nm as the nominal visible range, the strongest visible line other than the D-lines is the line at 568.8205 which has an intensity about 0.7% of that of the strongest line. All other lines are a factor of two or more fainter than that one, so for most practical purposes, all the light from luminous sodium comes from the D-lines.

Sodium Doublet Energy Levels

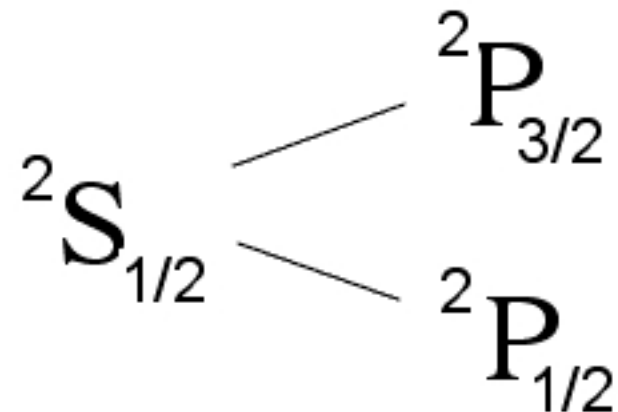
The well known bright doublet which is responsible for the bright yellow light from a sodium lamp may be used to demonstrate several of the influences which cause splitting of the emission lines of atomic spectra. The transition which gives rise to the doublet is from the 3p to the 3s level, levels which would be the same in the hydrogen atom. The fact that the 3s state (total orbital angular momentum quantum number $L = 0$) is lower than the 3p state ($L=1$) is a good example of the dependence of atomic energy levels on orbital angular momentum. The 3s electron penetrates the 1s shell more and is less effectively shielded than the 3p electron, so the 3s level is lower (more tightly bound). The fact that there is a doublet shows the smaller dependence of the atomic energy levels on the total angular momentum. The 3p level is split into states with total angular momentum $J=3/2$ and $J=1/2$ by interaction of the orbital angular momentum with that of the electron spin. This effect is called the spin-orbit coupling.



Sodium Doublet Energy Levels

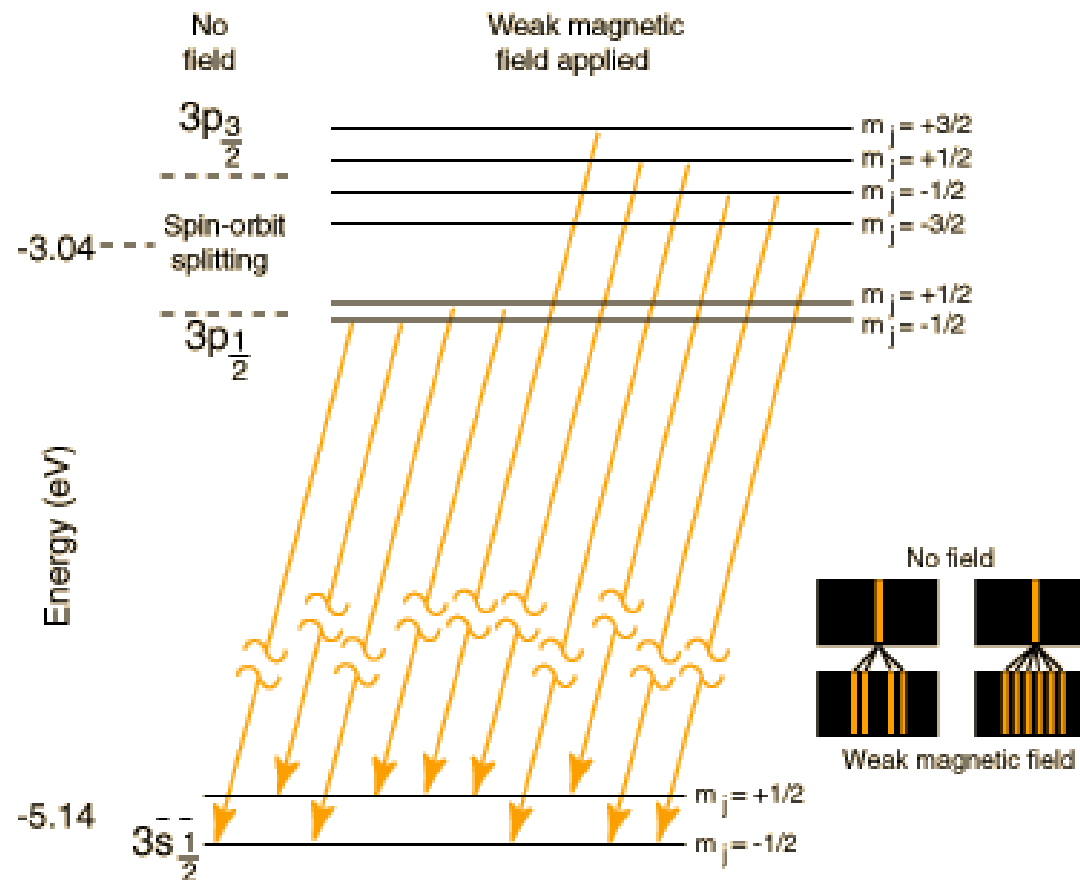
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Note that the Term Symbols for the state are actually:



The Sodium Zeeman Effect

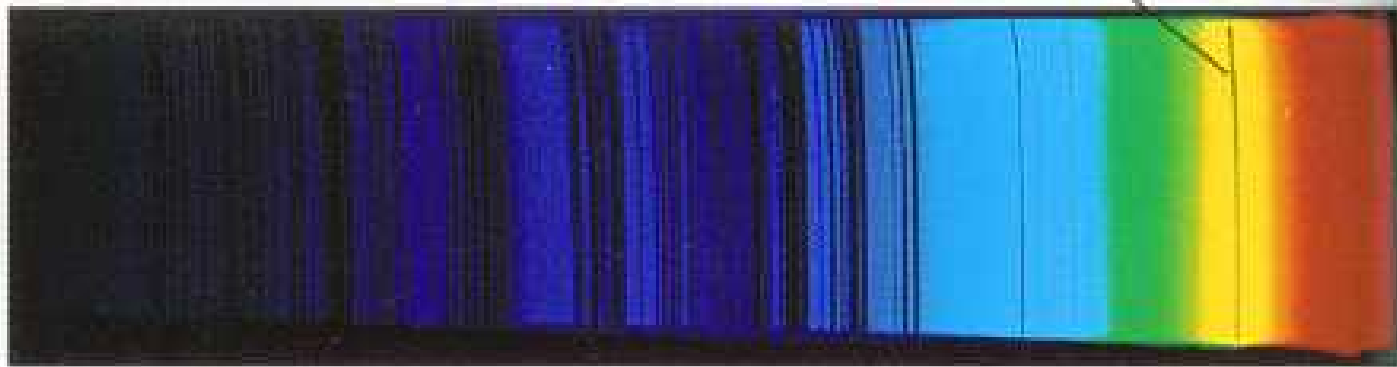
In the presence of an additional externally applied magnetic field, these levels are further split by the magnetic dipole energy, showing dependence of the energies on the z-component of the total angular momentum. This splitting is called the Zeeman effect.



Solar Emission Spectrum

Solar spectrum
showing absorption lines

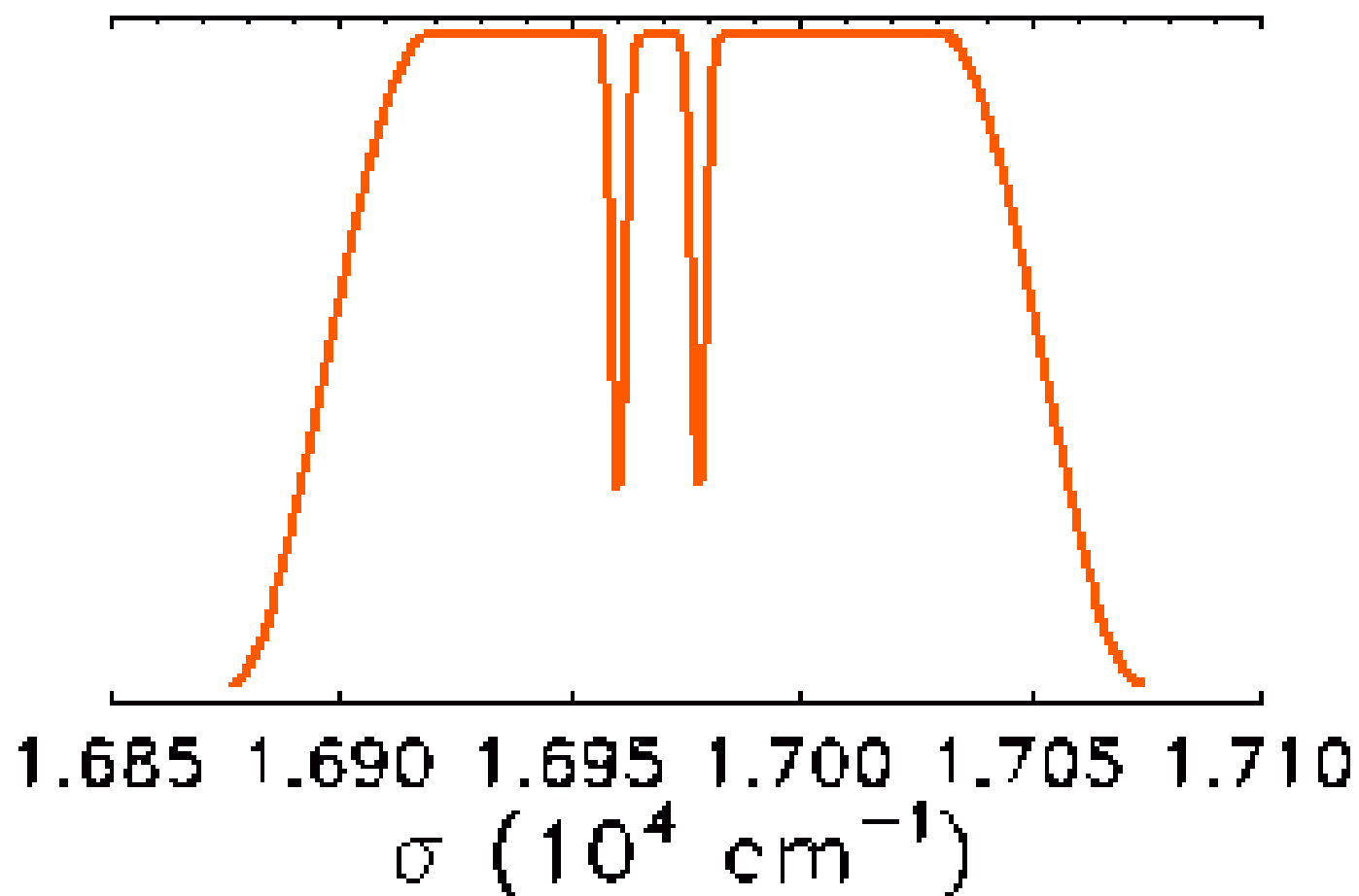
Sodium



Emission spectrum of sodium

Sodium

Interferometric Emission Spectrum



Sodium Street Lamps

