King Fahd University of Petroleum & Minerals
Physics Department
Phys212- Quiz#9

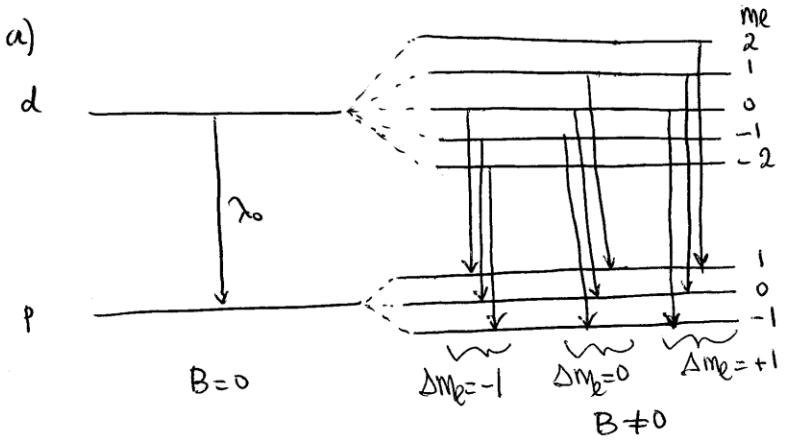
Name: Key ID#:

One of the most prominent spectral lines of cadmium is the one with wavelength $\lambda = 643.8$ nm (d → p) transition. Cadmium atoms exhibit normal Zeeman Effect when placed in a uniform magnetic field of 5 T.

(a) Show a diagram of the transitions before and after the application of the magnetic field.

(b) Calculate the wavelength of the three components of the normal Zeeman pattern.

a)



b) $\omega_0 = \frac{2\pi c}{\lambda_0} = 2.9279 \times 10^{15}$ Hz

$\omega_L = \frac{eB}{2m_e} = 4.3956 \times 10^{11}$ Hz

$\omega' = \omega_0 + \omega_L = 2.9283 \times 10^{15}$ Hz $\Rightarrow \lambda' = \frac{2\pi c}{\omega'} = \boxed{643.8876\text{ nm}}$

$\omega'' = \omega_0 - \omega_L = 2.9275 \times 10^{15}$ Hz $\Rightarrow \lambda'' = \frac{2\pi c}{\omega''} = \boxed{643.8789\text{ nm}}$