Spectroscopy

Exercises Chapter 2C

1. Calculate the radiative lifetime of the $J=1$ rotational level of HCl and DCl within the rigid rotor approximation given the equilibrium bond length $r_e=1.27$ Å and transition dipole moment matrix element $\mu=1.05$ D.

   Calculate the radiative lifetime of the v=1 vibrational level of HCl and DCl within the harmonic oscillator approximation given the force constant $k=478$ N/m and transition dipole moment matrix element $\mu=0.07$ D.

   Note: 1 D = 3.33564×10^{-30} C·m

2. Calculate the radiative lifetime of the $2p_z$ state of the hydrogen atom.