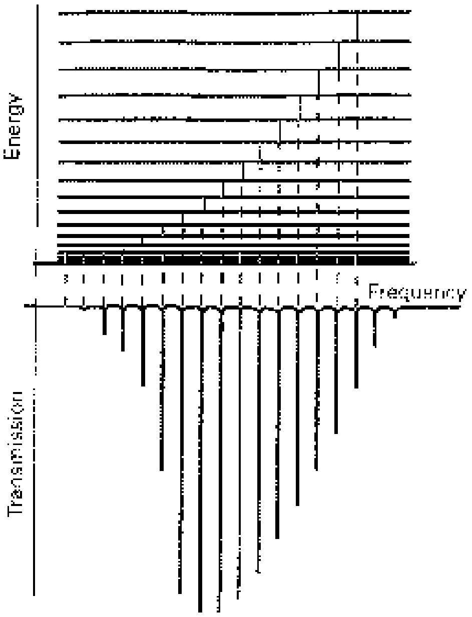
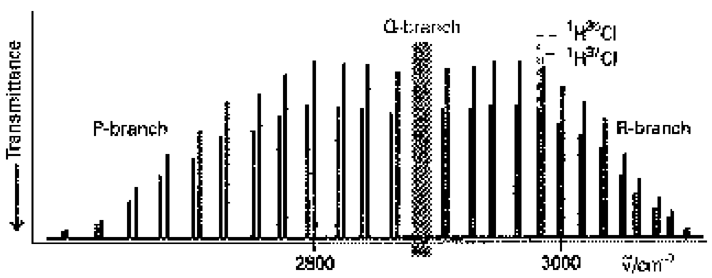


16.26 The rotational energy levels of a linear rotor, the transitions allowed by the selection rule $\Delta J = \pm 1$, and a typical pure rotational absorption spectrum. The intensities reflect the populations of the initial level in each case and the strengths of the transition dipole moments

For a typical molecule (for example, OCS, with $B = 0.2$ temperature, $kT \approx 1000hcB$, so $J_{max} \approx 20$.



16.41 A high-resolution vibration–rotation spectrum of HCl. The lines appear in pairs because $H^{35}Cl$ and $H^{37}Cl$ both contribute (their abundance ratio is 3:1). There is no Q branch, because $\Delta J = 0$ is forbidden for this molecule.

from: ***Physical Chemistry***, *5th Ed.*, by Peter Atkins, W.H. Freeman, N.Y., pp. 564 and 574

Vibration-Rotation Spectrum of HCl from Chemistry 164A