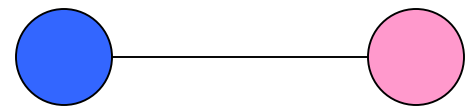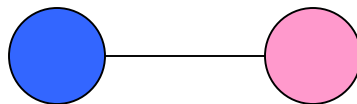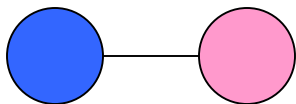# The Dipole Moment Expansion

The permanent dipole moment of a molecule oscillates about an equilibrium value as the molecule vibrates. Thus, the dipole moment depends on the nuclear coordinate Q.

$$\mu(Q) = \mu_0 + \left(\frac{\partial\mu}{\partial Q}\right)Q + \ldots$$

where μ is the dipole operator.

Rotational Transitions

Rotational transitions arise from the rotation of the permanent dipole moment that can interact with an electromagnetic field in the microwave region of the spectrum.

$$\mu(Q) = \mu_0 + \left(\frac{\partial \mu}{\partial Q}\right) Q + \ldots$$