

Molecular Vibrations [pmln2]

N -atomic molecule has $3N$ degrees of freedom.

Assumption: intra-atomic degrees of freedom are frozen out.

- 3 translational modes
- 3 rotational modes (2 for linear molecule)
- $3N - 6$ vibrational modes ($3N - 5$ for linear molecule)

Vibrational modes of linear molecules:

- in-line modes: $N - 1$
- out-of-line modes: $2N - 4$

Vibrational modes of planar molecules:

- in-plane modes: $2N - 3$
- out-of-plane modes: $N - 3$

Vibrational modes for $N = 2$:

- 1 in-line mode

Vibrational modes for $N = 3$ (linear molecule):

- 2 in-line modes
- 2 out-of-line modes

Vibrational modes for $N = 3$ (planar molecule):

- 3 in-plane modes

