

## Vibrations of Polyatomics

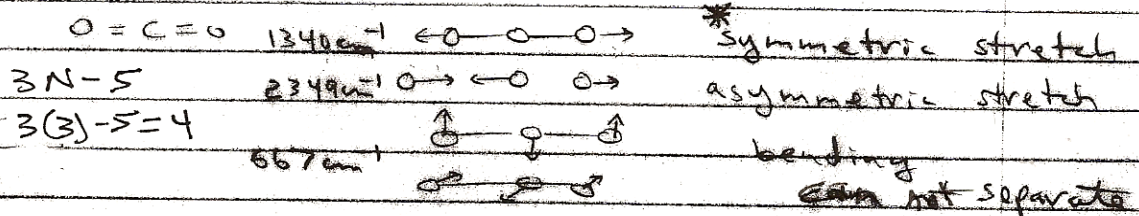
vibrational modes in molecule of  $N$  atoms

$3N$   
degrees of  
freedom

linear	$3N-5$	$3N-5$	3 translational	2 rotational
non-linear	$3N-6$	$3N-6$	3 translational	3 rotational

I identify the normal modes and which frequency is associated with each normal mode

Normal modes mutual independent  
synchronous motions of groups of atoms  
any one mode can be excited without exciting the others



less energy to bend than to stretch

\* note that symmetric stretch does not result in a change in dipole moment so infrared inactive  
others are infrared active

collisions usually cause broad lines with no rotational structure so  
solid and liquid don't show rotational branch structure