COUPLED INTERACTIONS

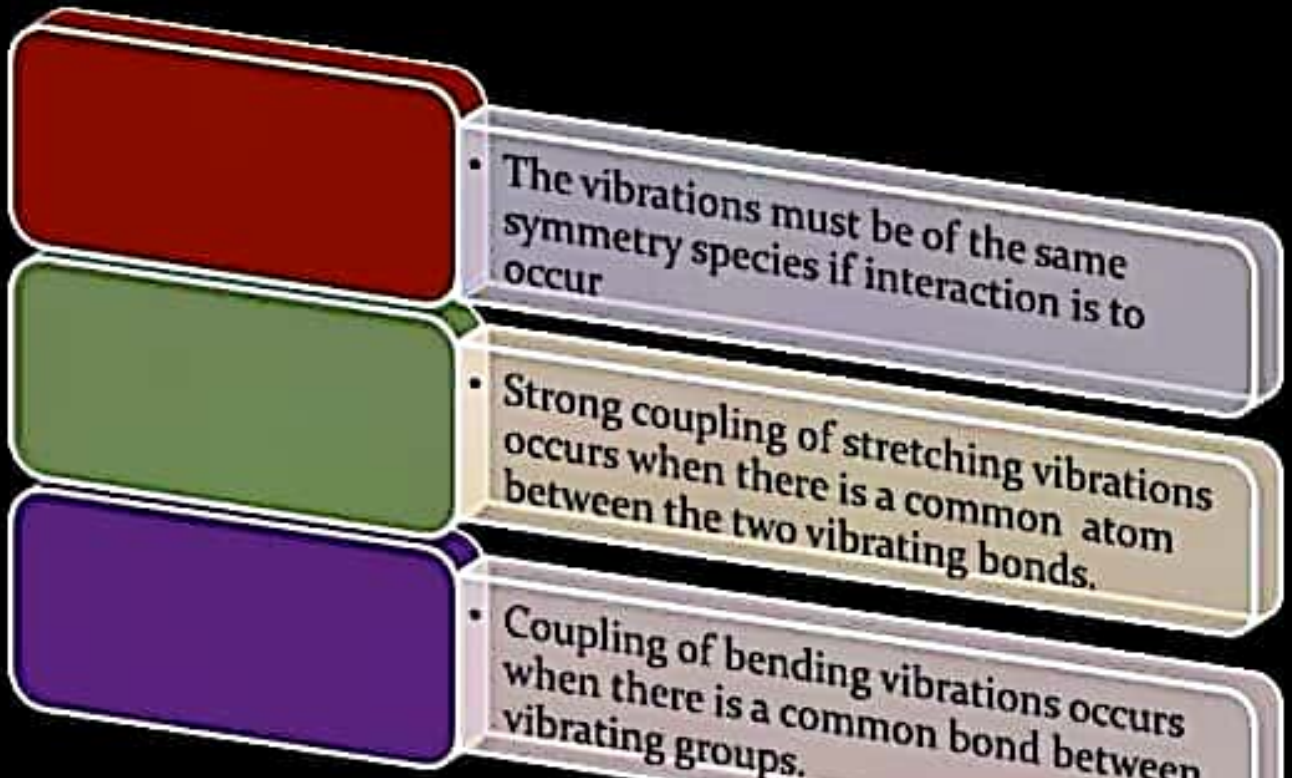
Interactions between vibrations can occur (Coupling) if the vibrating bonds are joined to a single, central atom.

This is because there is mechanical coupling interaction between the oscillators.

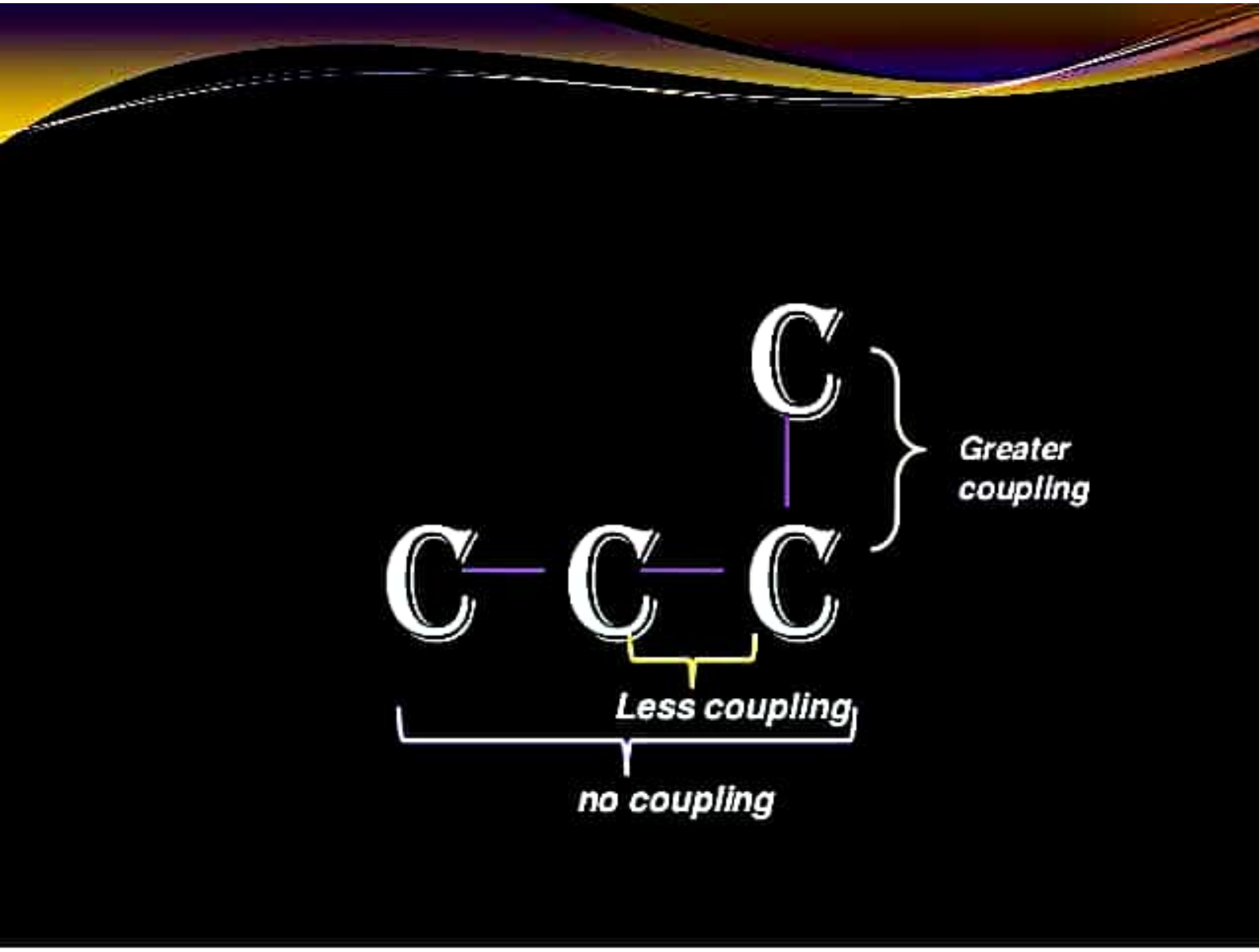
Example:

C=O (both symmetric and asymmetric stretching vibrations)

REQUIREMENTS FOR COUPLING



- Coupling is greatest when the coupled groups have approximately equal energies
- Coupling between a stretching vibration and a bending vibration occurs if the stretching bond is one side of an angle varied by bending vibration.
- No coupling is seen between groups separated by two or more bonds



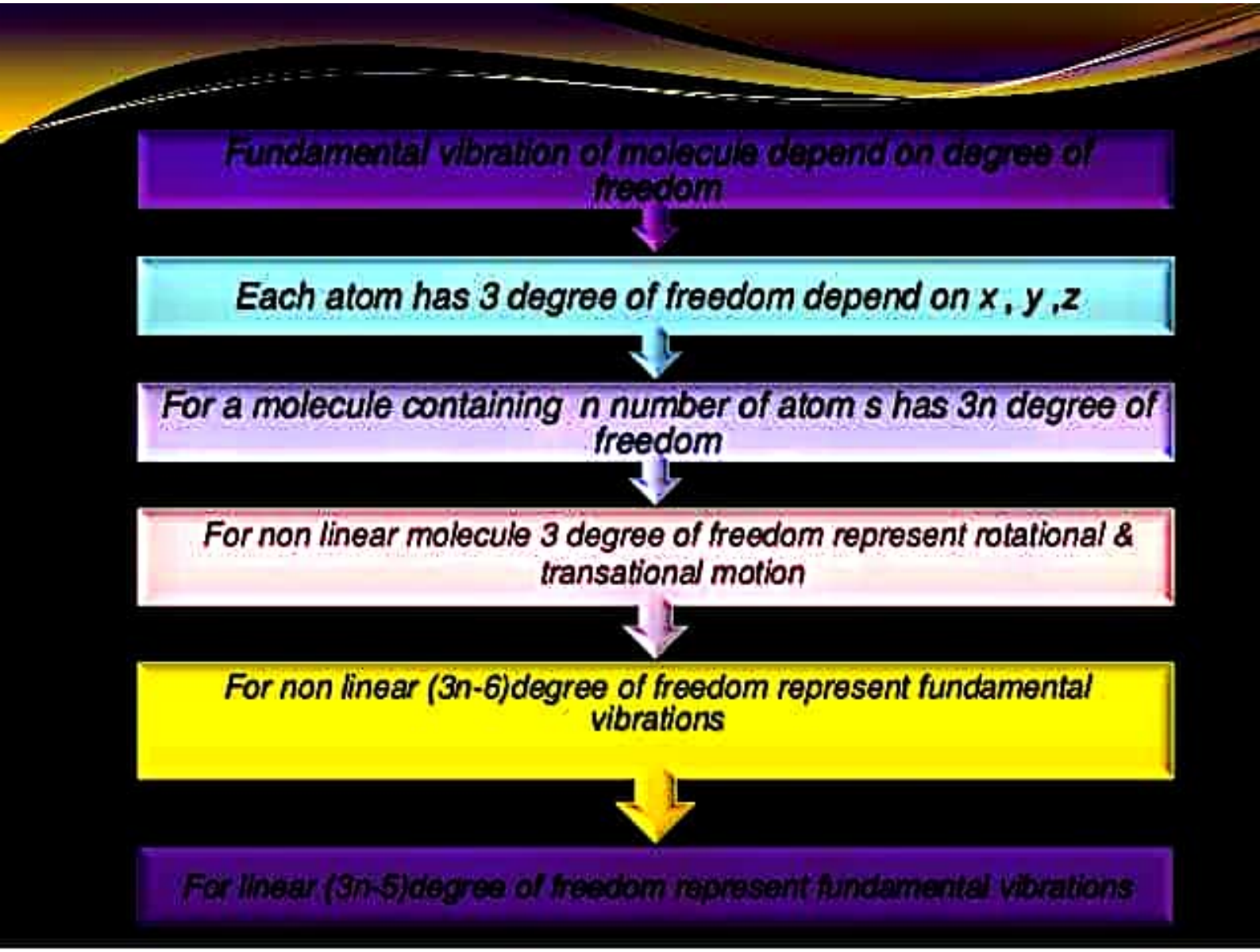
Stronger bonds O-H, N-H & C-H
weaker bonds C-C & C-O bond.

EFFECTS OF BONDS: C=C stretching is expected to absorb at a higher frequency than C-C stretching.

Example: C≡C 2200cm^{-1}
C=C 1650cm^{-1}
C-C 1200cm^{-1}

THE RELATIVE MASS OF THE ATOMS: heavier the atoms lower is the vibration frequency of the bond between them.

THE FORCE CONSTANT OF THE BONDS: Stronger the bond higher is the vibration frequency.



All vibrational changes don't appear as band

Only those vibrational changes that result in change in dipole movement appear as band