

# Vibrational Spectroscopy: Theory

- Harmonic oscillator – based on the classical “spring”

$$\nu_m = \frac{1}{2\pi} \sqrt{\frac{k}{\mu}}$$

$\nu_m$  is the natural frequency of the oscillator (a.k.a. the fundamental vibrational wavenumber)  
 $k$  is the Hooke's law force constant (now for the chemical bond)

$$E = \left(v + \frac{1}{2}\right) h \nu_m$$

$v$  is the vibrational quantum number  
 $h$  is Planck's constant

Note – all  $E$  are potential energies ( $V$ )!

- Since  $v$  must be a whole number (see Ex. 16-1, pg. 386):

$$\Delta E = h \nu_m = \frac{h}{2\pi} \sqrt{\frac{k}{\mu}} \quad \text{and} \quad \bar{\nu} = 5.3 \times 10^{-12} \sqrt{\frac{k}{\mu}}$$

(wavenumbers)

- The potential energy function is:

$$E_{HO}(r) = \frac{1}{2} k (r - r_e)^2 \quad \text{or} \quad E_{HO}(r) = \frac{1}{2} \mu (2\pi c \nu_m)^2 (r - r_e)^2$$

$r$  is the distance (bond distance)  
 $r_e$  is the equilibrium distance

# Theory Of Vibrational Spectroscopy

**Daniela Niemeyer**



## **Theory Of Vibrational Spectroscopy:**

## Reviewing **Theory Of Vibrational Spectroscopy**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Theory Of Vibrational Spectroscopy**," an enthralling opus penned by a very acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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