$K = 1.6\ kN/m$

$N = \frac{kg \cdot m}{s^2} \longrightarrow \frac{1}{1.6\ldots} \cdot 10^{23} \cdot 10^{10} \cdot 10^{-24}$

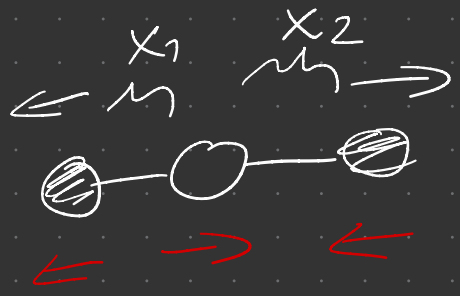
$= m_{ASU}\, Å/(ps)^2$

$[N] = \frac{M\,L}{T^2}$

$N/m \longrightarrow \frac{1}{1.602} \cdot 10^{-1}\, m_{ASU}/(ps)^2$

$1.6\,kN/m \approx 99\, m_{ASU}/(ps)^2$

6. $CO_2$, $K = 1{,}6\ kN/m$




$$\nu_0 = \frac{1}{2\pi}\sqrt{\frac{k}{m}}, \quad 4\pi^2\nu^2 = \frac{k}{m}$$

$$\tilde{\nu} = \frac{1}{\lambda}, \quad \nu = \frac{c}{\lambda} = c\tilde{\nu}$$

$$\mathcal{H} = \sum_i^3 \frac{p_i^2}{2m} +$$

$$F_1 = -K$$

$$\mathcal{L} = T - V = \frac{1}{2}m(\dot{x}_1^2 + \dot{x}_3^2) + \frac{1}{2}M(\dot{x}_2^2) - \frac{1}{2}(x_2 - x_1)^2 K - \frac{1}{2}K(x_3 - x_2)^2$$

lagrange's eq:

$$m\ddot{x}_1 = K(x_2 - x_1)$$

$$M\ddot{x}_2 = -K(x_2 - x_1) + k(x_3 - x_2) = K(x_1 + x_2) - 2Kx_2$$

$$m\ddot{x}_3 = -K(x_3 - x_2)$$

Ansatz $x_i = A_i e^{i\omega t}$

→ syst of eq

$$(-m\omega^2 + K)A_1 - KA_2 = 0$$

$$-KA_1 + (-M\omega^2 + 2K)A_2 - KA_3 = 0$$

$$-kA_2 + (-m\omega^2 + K)A_3 = 0$$

$$\rightarrow \begin{vmatrix} -m\omega^2 + K & -K & 0 \\ -K & -M\omega^2 + 2K & -K \\ 0 & -K & -m\omega^2 + K \end{vmatrix} = 0$$

eigenvalues

$$\omega_1 = 0 \qquad \omega_2 = \sqrt{\frac{K}{m}}$$

$$\omega_3 = \sqrt{\frac{K(1 + 2m/M)}{m}}$$

$M = m_C = 12.011\,u = {}^{12.011}/_{9649}$

$m = m_O = 15.99\,u = {}^{15.99}/_{9649}$

$K = 1.6\,kN/m = {}^{1600}/_{16.0218}$

$$\omega_2 = \sqrt{\frac{K}{m}} = 245.489\ldots \approx 39.07\,THz$$

$$\omega_3 = \sqrt{\frac{K(1+2m/M)}{m}} = 469.801 \approx 74.77\,Hz$$