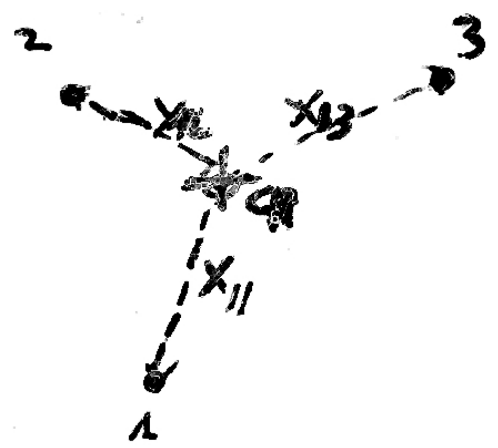
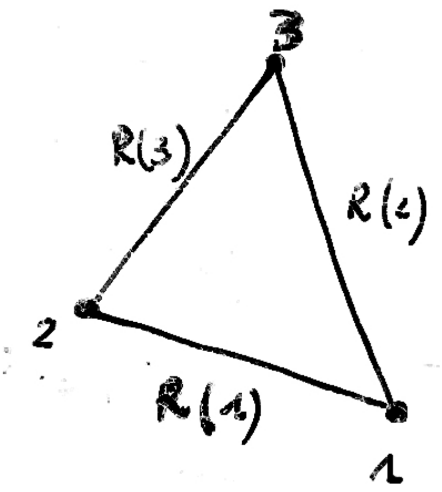
$$\begin{array}{c} \longleftarrow \text{ATOMS} \longrightarrow \\ \vec{X} = \begin{bmatrix} PAR(7) & PAR(10) & -\frac{m_1}{m_3} PAR(7) - \frac{m_2}{m_3} PAR(10) \\ PAR(8) & PAR(11) & -\frac{m_1}{m_3} PAR(8) - \frac{m_2}{m_3} PAR(11) \\ PAR(9) & PAR(12) & -\frac{m_1}{m_3} PAR(9) - \frac{m_2}{m_3} PAR(12) \end{bmatrix} \end{array}$$

$$\dot{\vec{X}} = \begin{bmatrix} PAR(1) & PAR(4) & -\frac{m_1}{m_3} PAR(1) - \frac{m_2}{m_3} PAR(4) \\ PAR(2) & PAR(5) & -\frac{m_1}{m_3} PAR(2) - \frac{m_2}{m_3} PAR(5) \\ PAR(3) & PAR(6) & -\frac{m_1}{m_3} PAR(3) - \frac{m_2}{m_3} PAR(6) \end{bmatrix}$$



COMPUTECOORDANDVELOC



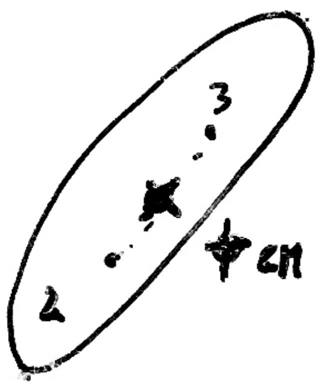
$$\xrightarrow[\text{SORTED}]{} \begin{cases} R(3) \\ R(1) \\ R(2) \end{cases} \longrightarrow \begin{cases} MOL = MOL(\\ ATMS = [2 \quad 3] \end{cases}$$

WITH PITAGORA'S TH

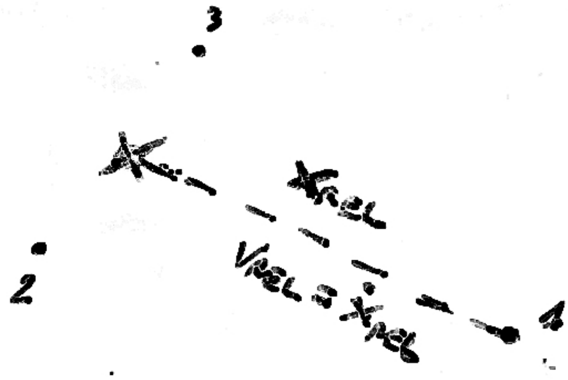
SETPAIRS

$$CM = \begin{bmatrix} \frac{m_2 X_{12} + m_3 X_{13}}{m_2 + m_3} & \frac{m_1 X_{11}}{m_1} \\ \frac{m_2 X_{22} + m_3 X_{23}}{m_2 + m_3} & \frac{m_1 X_{21}}{m_1} \\ \frac{m_2 X_{32} + m_3 X_{33}}{m_2 + m_3} & \frac{m_1 X_{31}}{m_1} \end{bmatrix} \qquad \dot{CM} = \frac{dCM}{dt}$$

TARGET



PROJECTILE



$$dist = \sqrt{X_{RELx}^2 + X_{RELy}^2 + X_{RELz}^2}$$

$$V = \sqrt{V_{RELx}^2 + V_{RELy}^2 + V_{RELz}^2}$$

$$t = -\frac{X_{RELx} V_{RELx} + X_{RELy} V_{RELy} + X_{RELz} V_{RELz}}{V_{RELx}^2 + V_{RELy}^2 + V_{RELz}^2}$$

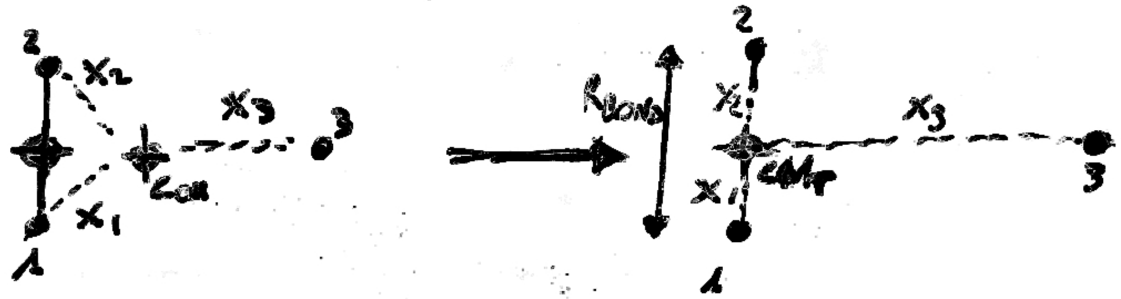
$$b = \sqrt{\left(X_{RELx} + t V_{RELx}\right)^2 + \left(X_{RELy} + t V_{RELy}\right)^2 + \left(X_{RELz} + t V_{RELz}\right)^2}$$

$$E_{KIN} = \sum_{i=1}^{3} \left(\frac{1}{2} \left(m_2 + m_3\right) c_{Mi1}^2 + \frac{1}{2} \left(m_1\right) c_{Mi2}^2 \right)$$

$$\vec{X}_J = \left(\vec{C}_{M_T} \times \dot{\vec{C}}_{M_T} + \vec{C}_{M_P} \times \dot{\vec{C}}_{M_P} \right) M_T.$$

$$f_a = \frac{M_a}{M_a + M_b} \qquad f_b = \frac{M_b}{M_a + M_b}$$

$$\begin{cases} \vec{X}_{CM_T} = f_a \vec{X}_a + f_b \vec{X}_b \\ \dot{\vec{X}}_{CM_T} = f_a \dot{\vec{X}}_a + f_b \dot{\vec{X}}_b \end{cases}$$



$$E_{INT_K} = \sum_{i=1}^{3} \frac{1}{2} \left(M_a \, x_{i_1}^2 + M_b \, x_{i_2}^2 \right)$$

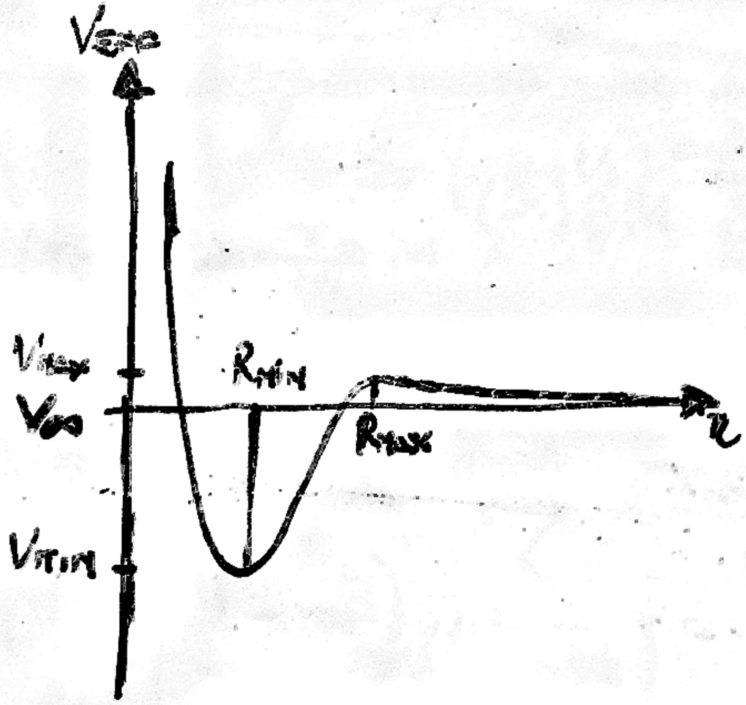
$$\text{AngMom} = \left\| \left(\vec{X}_1 \times \dot{\vec{X}}_1 \right) m_1 + \left(\vec{X}_2 \times \dot{\vec{X}}_2 \right) m_2 \right\|_2$$

$$\mu = \frac{m_a\, m_b}{m_a + m_b}$$

$$V_c = \frac{1}{2} \frac{Ang\,Mom^2}{\mu R^2} = \frac{1}{2} \frac{(J + 1/2)^2}{\mu R^2}$$ CENTRIFUGAL POTENTIAL

$$V_{EFF} = V_{DIAT} + V_c$$

$\begin{cases} R_{MIN} \\ V_{MIN} \end{cases}$ and $\begin{cases} R_{MAX} \\ V_{MAX} \end{cases}$

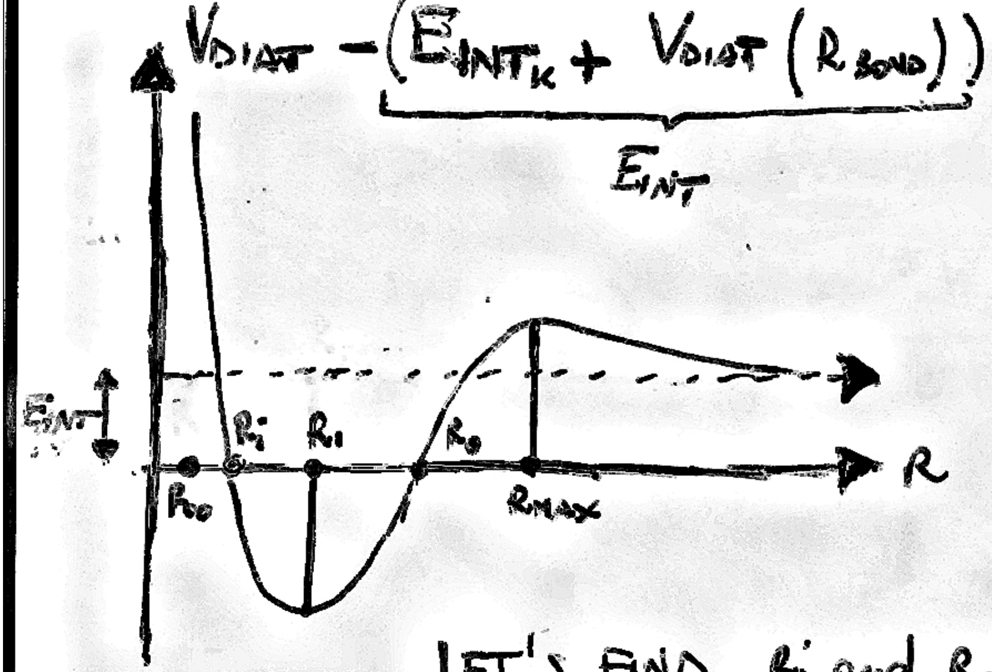


LET'S FIND R_{MIN} AND THROUGH FIND EXOTIC.

IF $\to$ $R_{BOND} > R_{MAX}$ $\to$ DISSOCIATED STATE

ELSEIF $E_{INT} \triangleq E_{INT_K} + V_{DIAT}$ $\to$ $> V_{MAX}$; $> V_{\infty}$ $\to$ [illegible]

EL[illegible]



LET'S FIND R_i and R_o THROUGH

<u>TURNING POINT</u>

CHEBYSHEV – GAUSS INTEGRAL FOR ACTION INTEGRAL:

$$\int_{-1}^{+1} \sqrt{1-x^2}\, g(x)\, dx \approx \sum_{i=1}^{N_{Gauss}} W_i\, g(x_i) \qquad x_i = \cos\left(\frac{i}{n+1}\pi\right) \qquad W_i = \frac{\pi}{n+1}\sin^2\left(\frac{i}{n+1}\pi\right)$$

50

$$2\pi\left(N+\tfrac{1}{2}\right) = 2\cdot\sqrt{2\mu}\cdot\sum_{i=2}^{N_{Gauss}}\sqrt{\left(E_{INT} - V_{EFF}(R_{p_i})\right)}\, W_i$$

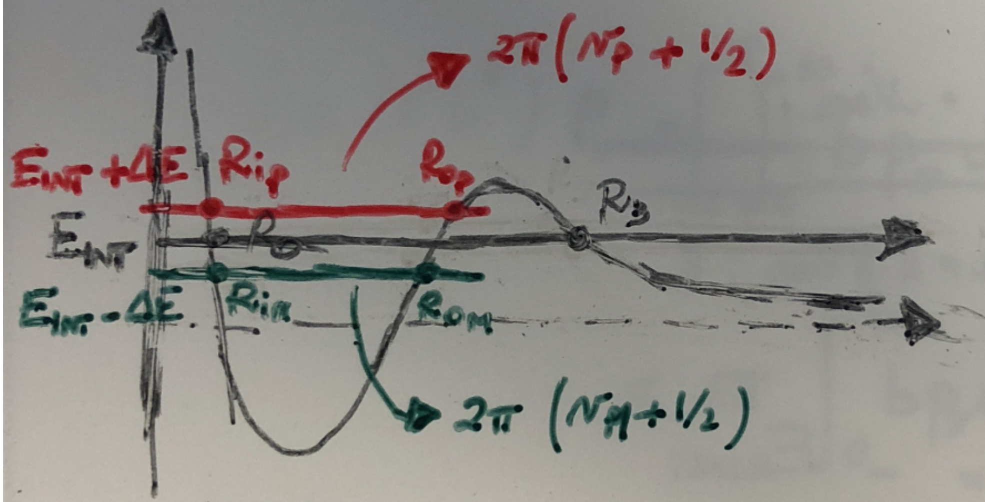
$$R_{p_i} = \frac{R_o + R_i}{2} + \underbrace{\frac{R_o - R_i}{2}}_{R_M} x_{i+1}$$

<u>ACTION INTEGRAL</u>

For solving the EBK QUANTIZATION CONDITION:

$$2\sqrt{2m}\int_{R_i}^{R_o}\sqrt{\left(E_{VJ} - V_{DIAT} - V_C\right)}\,dR = \underbrace{h}_{2\pi\hbar}\left(v + 1/2\right)$$

Γ IF $E_{INT} > V_{D0}$



$$\Delta E = \begin{cases} \varepsilon \ (\text{minimum}) \\ \dfrac{V_{MAX} - E_{INT}}{2} \end{cases}$$

$$dN/dE = \frac{(N_p + \cancel{1/2}) - (N_M + \cancel{1/2})}{2\Delta E}$$

$$\left.\begin{matrix} R_0 \\ R_B \end{matrix}\right\} \rightarrow 2\pi\left(N_{TEMP} + 1/2\right)$$

$$\Gamma \triangleq \frac{e^{-2\pi(N_{TEMP} + 1/2)}}{dN/dE} \qquad t_{LIFE} = \frac{1}{\Gamma}$$

NB: $t_{LIFE} \underset{MUST}{>} t_{MIN}$

$$2\pi\left(N+\frac{1}{2}\right) = 2\pi\left(N+\frac{1}{2}\right) + \left[\mathrm{Gammafun}\left(N_{TEMP}\right) - N_{TEMP}\left(\mathrm{Log}\left(\left|N_{TEMP}\right|\right) - 1\right)\right] R_{ADG}$$

FINAL

L

$$dot_3 = \frac{V_{REL\,F} \cdot V_{REL\,i}}{\sqrt{\|V_{REL\,F}\|\,\|V_{REL\,i}\|}}$$

$$\Delta E_{KIN} = E_{KIN\,F} - E_{KIN\,i}$$