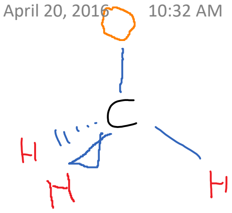
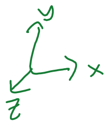
Methoxy

Wednesday, April 20, 2016 10:32 AM



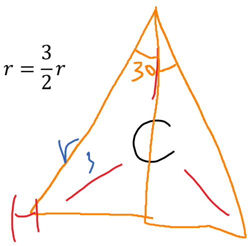


$$\vec{r}_C = \langle 0,0,0 \rangle$$
$$\vec{r_1} = \langle 0, r_{1,y}, r_{1,z} \rangle$$
$$\vec{r_2} = \langle r_{2,x}, r_{2,y}, r_{2,z} \rangle$$
$$\vec{r_3} = \langle r_{3,x}, r_{3,y}, r_{3,z} \rangle$$
$$\vec{r}_O = \langle 0,0, r_{O,z} \rangle$$
$$|\vec{r}_O| = r_{O,z}$$

$$r_{3,x} = -r_{2,x} = -x'_H$$
$$r_{2,y} = r_{3,y} = -y'_H$$
$$r_{1,z} = r_{2,z} = r_{3,z} = -r_{H,z}$$
$$r_{1,y} = \sqrt{{y'}_H^2 + {x'}_H^2}$$

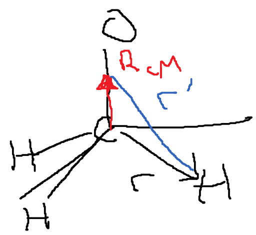
$$\vec{r_1} = \langle 0, r_{x,y}, -r_{H,z} \rangle$$
$$\vec{r_2} = \left\langle \frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_{H,z} \right\rangle$$
$$\vec{r_3} = \left\langle -\frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_{H,z} \right\rangle$$

$$\frac{1}{2} r + r = \frac{3}{2} r$$



$$\frac{3}{2} r = \sqrt{3} x$$
$$\frac{\sqrt{3}}{2} r = x$$

$$R_{CM} = \frac{1}{M} \sum_i^4 m_i r_i = \frac{1}{M} (m_c \vec{r_c} + m_h (\vec{r}_1 + \vec{r}_2 + \vec{r}_3) + m_O \vec{r}_O) = \frac{1}{m_c + 3m_h + m_O} \left[m_H \left(\langle 0, r_{x,y}, -r_{H,z} \rangle + \left\langle \frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_{H,z} \right\rangle + \left\langle -\frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_{H,z} \right\rangle \right) + m_O \langle 0,0,r_{O,z} \rangle \right]$$
$$= \frac{1}{m_c + 3m_h + m_O} [m_H (\langle 0,0,-r_{H,z} \rangle + \langle 0,0,-r_{H,z} \rangle + \langle 0,0,-r_{H,z} \rangle) + m_O \langle 0,0,r_{O,z} \rangle]$$
$$= \frac{m_H \langle 0,0,-3r_{H,z} \rangle + m_O \langle 0,0,r_{O,z} \rangle}{m_c + 3m_h + m_O}$$
$$R_{CM} = \frac{\langle 0,0, m_O r_{O,z} - 3m_H r_{H,z} \rangle}{m_c + 3m_h + m_O} \ or \ \frac{m_O r_{O,z} - 3m_H r_{H,z}}{m_c + 3m_h + m_O} \hat{z}$$



$$\vec{L} = \sum_i^4 r_i \times m_i \dot{\vec{r}}_i = \vec{R} \times \vec{P} + \sum_i^4 \vec{r}_i' \times m_i \dot{\vec{r}}_i'$$

Using new frame with Center of mass as the origin

$$\vec{r}_O = \langle 0,0,r_{O,z} \rangle, \qquad \vec{r}_O' = \langle 0,0,r_{O,z} - R_{CM} \rangle$$
$$\vec{r_1} = \langle 0, r_{x,y}, -r_z \rangle \Rightarrow, \qquad \vec{r}_1' = \langle 0, r_{x,y}, -r_{H,z} - R_{CM} \rangle$$
$$\vec{r_2} = \left\langle \frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_z \right\rangle \Rightarrow \quad \vec{r}_2' = \left\langle \frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_{H,z} - R_{CM} \right\rangle$$
$$\vec{r_3} = \left\langle -\frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_z \right\rangle \Rightarrow \quad \vec{r}_3' = \left\langle -\frac{\sqrt{3}}{2} r_{x,y}, -\frac{1}{2} r_{x,y}, -r_{H,z} - R_{CM} \right\rangle$$
$$\vec{r}_C = 0 \qquad \Rightarrow \qquad \vec{r}_C' = \langle 0,0,-R_{CM} \rangle$$

$$I_{xx} = \sum_i^5 m_i \left(r_y^{2\prime} + r_z^{2\prime} \right)_i, \qquad I_{xy} = I_{yx} = -\sum m_i (xy)_i$$
$$I_{yy} = \sum_i^5 m_i \left(r_x^{2\prime} + r_z^{2\prime} \right)_i, \qquad I_{xz} = I_{zx} = -\sum m_i (xz)_i$$
$$I_{zz} = \sum_i^5 m_i \left(r_x^{2\prime} + r_y^{2\prime} \right)_i, \qquad I_{yz} = I_{yz} = -\sum m_i (yz)_i$$

$$I_{xx} = \sum_i^5 m_i \left(r_y^{2\prime} + r_z^{2\prime} \right)_i =$$