Ex 8-13
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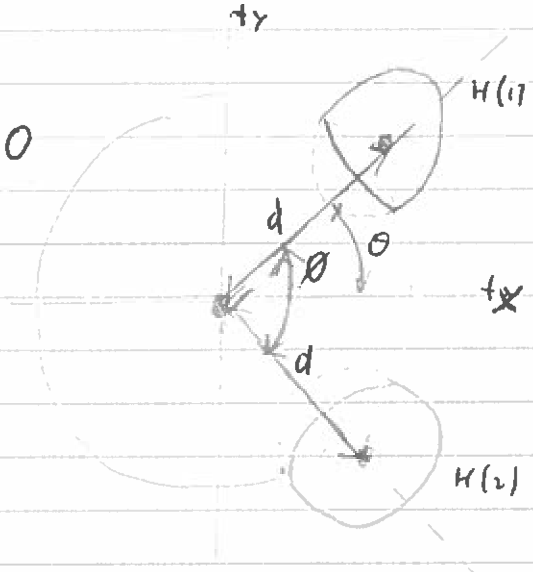


Due to symmetry, expect center of mass to exist somewhere along +x-axis.

$\emptyset = 105° = 2\theta$
$d = 9.57 \times 10^{-11}$ m
$m_O = 16.0u = 16m$
$m_H = 1.0u$

$$X_{cm} = \frac{\sum_i m_i x_i}{\sum m_i} = \frac{m_O x_O + m_{H_1} x_{H_1} + m_{H_2} x_{H_2}}{m_O + m_{H1} + m_{H2}}$$

$$Y_{cm} = \frac{\sum_i m_i y_i}{\sum m_i} = \frac{m_O y_O + m_{H_1} Y_{H_1} + m_{H_2} Y_{H2}}{m_O + m_{H1} + m_{H2}}$$

We see: $x_O = 0, \ y_O = 0.$
$x_{H1} = x_{H2} = x_H$
$y_{H1} = -y_{H2}$
$m_{H1} = m_{H2} = m_H$

$\therefore \ X_{cm} = \frac{2m_H x_H}{m_O + 2m_H}$ , $Y_{cm} = \frac{m_H (-Y_{H_2}}{m_O + 2m_H}$

$x_H = d\cos\theta$

$$\therefore \ X_{cm} = \frac{2m_H d\cos\theta}{16m_H + 2m_H} = \frac{1}{9} d\cos\theta$$

$$X_{cm} = \frac{1}{9}(9.57 \times 10^{-11} \text{ m})\cos((0.5)105°) = 6.47 \times$$