

# Homework 3

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1) Derive an expression for the classical kinetic energy for two masses in  $\mathbf{R}$  and  $\mathbf{r}$ , the position vector of their center of mass and the interparticle position vector, respectively

$$T = \frac{1}{2}M\dot{R}^2 + \frac{1}{2}\mu\dot{r}^2 \quad (1)$$

Where

$$\dot{R}^2 = \dot{X}^2 + \dot{Y}^2 + \dot{Z}^2$$

$$\dot{r}^2 = \dot{x}^2 + \dot{y}^2 + \dot{z}^2$$

$$M = m_1 + m_2$$

$$\mu = \frac{m_1 m_2}{M}$$

Hint: Follow the outline given in class. Relate the position vectors  $\mathbf{r}_1$  and  $\mathbf{r}_2$  to  $\mathbf{R}$  and  $\mathbf{r}$

2) MQM Problems:

Problem	Begins With
3.13	Modify ... HI molecule treated as a 3D rotor
3.15	Calculate the angle
3.29	The State of the electron
3.30	A diatomic molecule