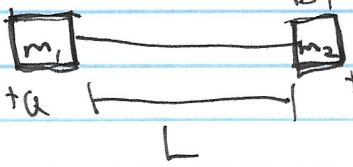
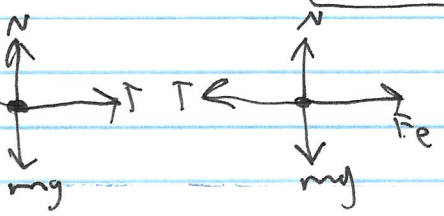
Discussion 8

a.) 

$U_e = \frac{kq^2}{L}$

b.) $F = k\frac{q^2}{L^2}$



c.) $U_{e_2} = \frac{kq^2}{d}$

d.) yes, no friction $\therefore$ all $U_e \to K$

e.) momentum is conserved because only force acting on object is conservative

f.) $\cancel{K_1}^{0} + U_{e_1} = K_2 + U_{e_2} \rightarrow \frac{1}{2}m_1 v^2 = -\frac{kq^2}{L} + \frac{kq^2}{d}$

$\therefore v_a^2 = \frac{2}{m_a}\left(\frac{kq^2}{d} + \frac{kq^2}{L}\right)$

$v = \sqrt{\frac{2}{m}\left(\frac{kq^2}{d} - \frac{kq^2}{L}\right)}$

$v_1 = \frac{m_2}{m_1}v_2$

$\frac{kq^2}{L} = \frac{kq^2}{d} + \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$

g.) $v = \sqrt{\frac{2}{m}\left(\frac{kq^2}{L}\right)}$ as $d \to \infty$, $U_2 \to 0$

$2\left(\frac{kq^2}{L} - \frac{kq^2}{d}\right)$

$v_2 = \left[\frac{2kq^2\left(\frac{1}{L} - \frac{1}{d}\right)}{m_2\left(\frac{m_2}{m_1} + 1\right)}\right]^{1/2}$

$\rightarrow v_1 = \left[\frac{2kq^2\left(\frac{1}{L} - \frac{1}{d}\right)}{m_1\left(\frac{m_1}{m_2} + 1\right)}\right]^{1/2}$

$\frac{1}{d} \to 0$ as $d \to \infty$

g.) $v_1 = \frac{2kq^2}{L}\Big/ m_1\left(1 + \frac{m_1}{m_2}\right)$

$v_2 = \frac{2kq^2}{L}\Big/ m_2\left(\frac{m_2}{m_1} + 1\right)$