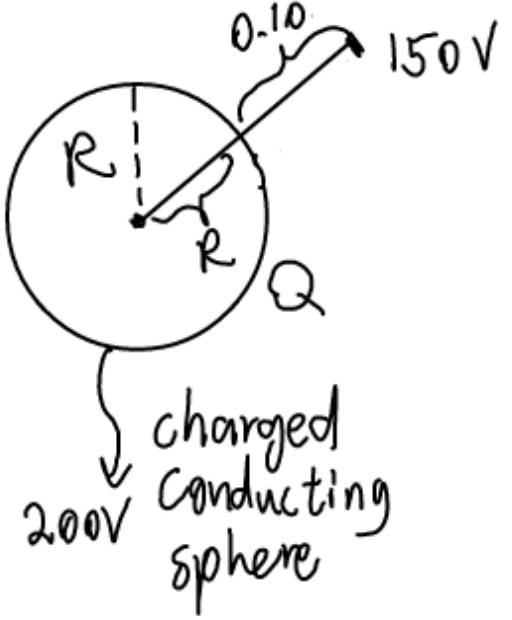


Find R:

$$V_1 = \frac{kQ}{R} = 200V$$

$$V_2 = \frac{kQ}{0.10} = 150V$$

$$\frac{V_1}{V_2} = \frac{200}{150}$$

plug R in V_1 to find Q.

$$V = \frac{kQ}{R} = 210V$$

$$E = \frac{kQ}{(R+0.10)^2} = 400\ V/m$$

$$\frac{V}{E} = \frac{(R+0.10)^2}{R}$$

$$= \frac{21}{40} \rightarrow 40R^2 + 8R + 0.4 = 21R$$

solve for R.
plug R back for Q.

$m_1 = 200\ g$

$q_1 = 15\ \mu C$

$\vec{V}_{1i} = 2.1\hat{i}\ m/s$

$m_2 = 5.00\ g$

$q_2 = 8.50\ \mu C$

$$m_1\vec{V}_{1i} + m_2\vec{V}_{2i} = m_1\vec{V}_{1f} + m_2\vec{V}_{2f}$$

$$m_1\vec{V}_{1i} = (m_1 + m_2)\vec{V}_c$$

$$V_c = 6\hat{i}\ \frac{m}{s}$$

$$K_i + U_i = K_f + U_f$$

$$\frac{1}{2}m_1 v_{1i}^2 + \frac{1}{2}m_2 v_{2i}^2 + 0 = \frac{1}{2}(m_1+m_2)V_c^2 + k_c\frac{q_1 q_2}{r_c}$$

solve for $r_c = 3.64\,m$

$$m_1\vec{v}_{1i} + \cancel{m_2\vec{v}_{2i}}^{0} = m_1 v_{1f} + m_2\vec{v}_{2f}$$

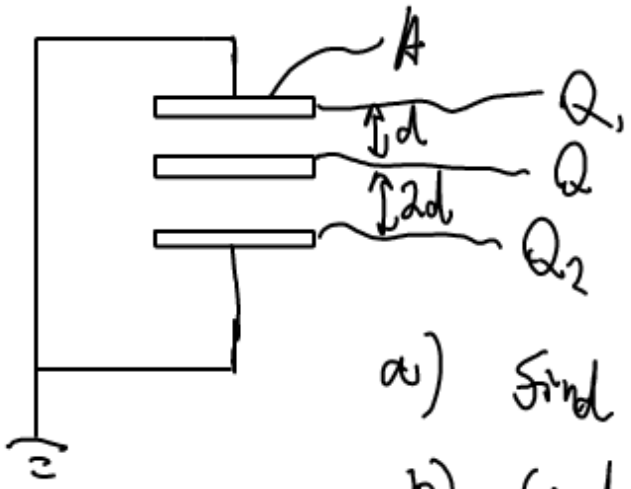
$$V_{1i} - V_{2i} = V_{2f} - V_{1f}$$

$$V - 0 = V_{2f} - V_{1f}$$

$$V_{2f} = V + V_{1f}$$

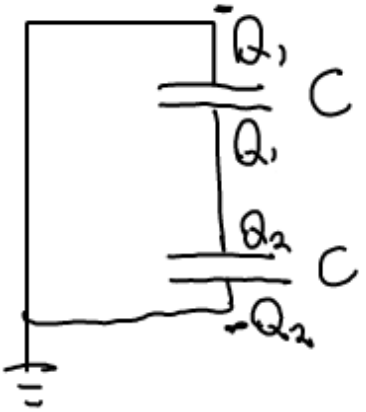
$$mV = m_1 v_{1f} + m_2(V + V_{1f}) = m_2 V + (m_1+m_2)V_{1f}$$

solve for V_{1f}



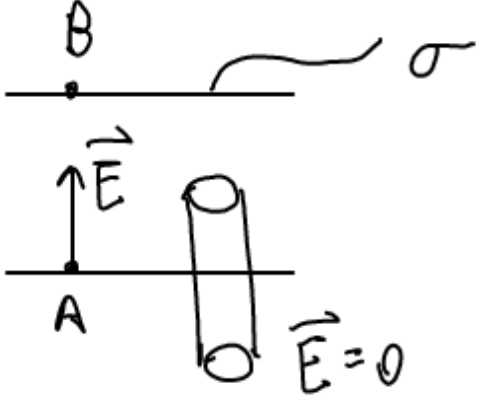
a) find Q_1 & Q_2

b) find ΔV between plates



$$\boxed{Q_1 + Q_2 = Q}$$

$$\boxed{\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}}$$



$$Q = \sigma A$$

$$\Phi = \int \vec{E} \cdot d\vec{A}$$

$$\frac{Q}{\epsilon_0} = EA$$

$$\frac{\sigma A}{\epsilon_0} = EA$$

$$E = \frac{\sigma}{\epsilon_0}$$

$$\boxed{E = \frac{\sigma}{\epsilon_0}}$$