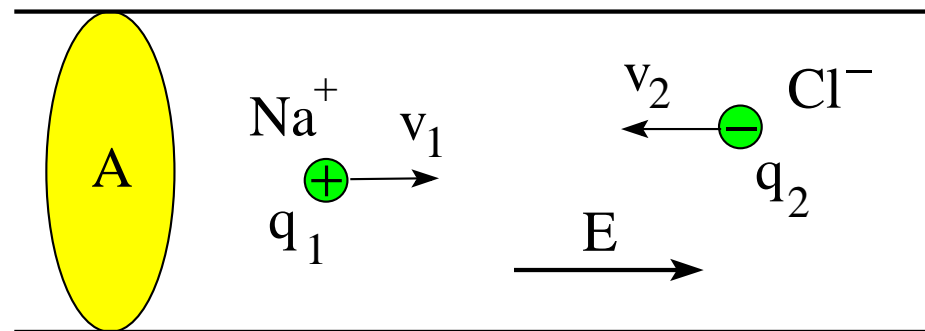Consider drift of Na^+ and Cl^- ions in a plastic pipe filled with salt water.

- $v_1 > 0$, $v_2 < 0$: drift velocities
- $q_1 > 0$, $q_2 < 0$: charge on ions
- n_1, n_2: number of charge carriers per unit volume

- Net charge flowing through area A in time dt: $dQ = n_1 q_1 v_1 A dt + n_2 q_2 v_2 A dt$ [C]
- Electric current through area A: $I \equiv \dfrac{dQ}{dt} = A(n_1 q_1 v_1 + n_2 q_2 v_2)$ [A]
- Current density: $\vec{J} = n_1 q_1 \vec{v_1} + n_2 q_2 \vec{v_2}$ [A/m^2]
- Current equals flux of current density: $I = \displaystyle\int \vec{J} \cdot d\vec{A}$