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1. Dano:  $R = U_0 + at + R$ ,  $U = U_0 + at$  |  $Q(t_0) = ?$

$$I(t) = \frac{U(t)}{R} = \frac{U_0}{R} + \frac{at}{R}$$

$$I = \frac{dq}{dt}$$

$$dq = I dt$$

$$Q = \int dq = \int_0^{t_0} I(t) dt = \int_0^{t_0} \left( \frac{U_0}{R} + \frac{at}{R} \right) dt$$

$$= \frac{U_0}{R} t_0 + \frac{at_0^2}{2R}$$

Answer:  $\frac{U_0 t_0}{R} + \frac{at_0^2}{2R}$

2. Dano:  $\rho$ ,  $Q$

~~I from Gauss~~  $j = \frac{I}{S} = \frac{I}{4\pi r^2}$  ①

$I = ?$   $\vec{j} = \sigma \vec{E}$  ②

$E = \frac{kQ}{r^2}$  ③

① & ③:  $\frac{I}{4\pi r^2} = \rho \cdot \frac{kQ}{r^2}$

$$I = \frac{4\pi kQ\rho}{S} = \frac{Q}{\rho \epsilon_0}$$

Answer:  $I = \frac{Q}{\rho \epsilon_0}$