

Quiz 4: Exam Review

Constant electric fields / capacitors:

$$\Delta V = |\vec{E}||\Delta\vec{x}| \quad \Delta PE = q\Delta V \quad KE = \frac{1}{2}mv^2 \quad Q = C\Delta V \quad C = \frac{\epsilon_0 A}{d}$$

$$F = \frac{k_e q_1 q_2}{r^2} \quad k_e = 9 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2} \quad I = \frac{\Delta Q}{\Delta t} = nqv_d A \quad E_{\text{cap}} = \frac{1}{2}Q\Delta V = \frac{Q^2}{2C}$$

1. Two particles are separated by a distance of 3.0 m; each exerts an electric force of 1.0 N on the other. If one particle carries 10 times as much electric charge as the other, what is the magnitude of the smaller charge? Note $p = 10^{-12}$, $n = 10^{-9}$, $\mu = 10^{-6}$, $k = 10^3$.

- 10 pC
- 10 μ C
- 10 nC
- 10 kC

2. Suppose that a wire has a nonuniform cross section (thicker in some parts than others). Is the drift velocity of the electrons the same everywhere along this wire? The resistivity?

- yes; yes
- yes; no
- no; yes
- no; no

3. Consider a simple parallel-plate capacitor whose plates are given equal and opposite charges and are separated by a distance D . The capacitor is not connected to a battery. Suppose the plates are pushed together until they are separated by a distance $d < D$. How does the final electrostatic energy stored in the capacitor compare to the initial energy?

- The final stored energy is smaller than the initial stored energy.
- The final stored energy is greater than the initial stored energy.
- They are the same.

4. Car batteries are often rated in ampere-hours. This unit by itself designates the amount of which of the following that can be drawn from the battery?

- charge
- power
- energy
- current