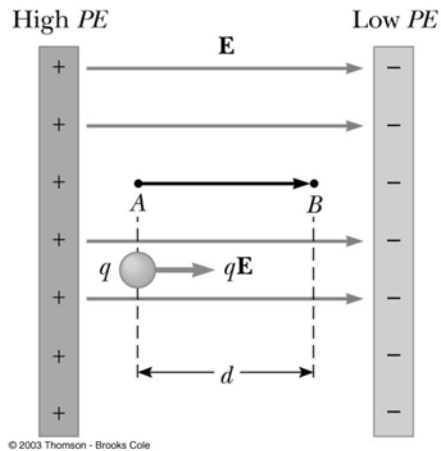


Chapter 16 Notes

Capacitance



+q wants to move right toward the negative plate since it would require less energy. +q is repelled from the + plate because it's oppositely charged. At **A**, higher PE, and at **B**, lower PE. Therefore, ΔPE will be negative since losing energy. As it loses PE, it gains KE.

$$\Delta PE = -W_{AB} = -qEd$$

Change in PE = potential difference = voltage

$$1 \text{ Volt} = 1 \text{ Joule/Coulomb}$$

q is the amount of charge in Coulombs

$$+q = 1.6 \times 10^{-19} \text{ C}$$

$\Delta PE/q = -Ed = \Delta V$ (**electric potential difference, aka voltage**) as q is moving from high PE to low PE, energy is lost(-), but KE is gained.

The direction of the Electric field, **E**, moves from + to -

Parallel plate capacitors—two oppositely charged plates of same **Area** with equal but opposite charge, and a distance **d** in meters apart.

Conservation of energy, so $\Delta PE = \Delta KE$

$$-PE = +KE$$

$$q\Delta V = \Delta PE = -Ed = \frac{1}{2}mv^2$$

velocity in m/s

work or energy in Joules

electric potential difference (voltage) in volts (V)

electric field **E** in $N/C = V/m$

Voltage is scalar, $V=kq/r$ where $k=9 \times 10^9 \text{ Nm}^2/\text{C}^2$

$$V_{\text{total}}=V_1+V_2+V_3\dots$$

$$W=q\Delta V$$

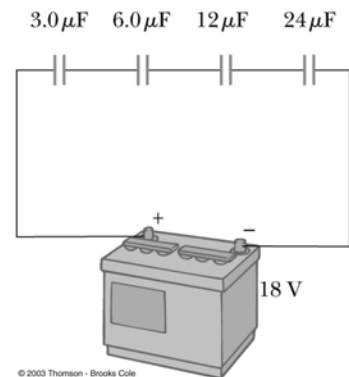
for small charges using $1\text{eV}=1.6 \times 10^{-19} \text{ Joules}$

$C=Q/V$ $C=\epsilon_0 A/d$ A is area in m^2 , d in meters, C in farads (F), and

$$\epsilon_0=8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$$

units Farad=Coulombs/Volts

Capacitors in Series



$$1/C_{\text{eq}}=1/C_1+1/C_2+1/C_3+1/C_4\dots$$

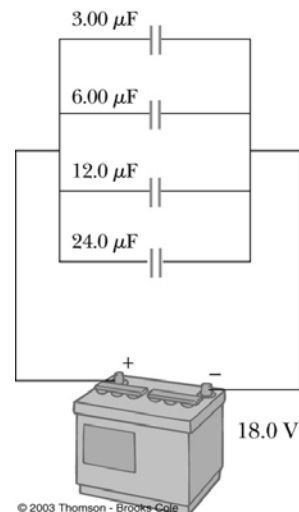
REMEMBER TO TAKE INVERSE OF SUM

$$V_{\text{total}}=V_1+V_2+V_3+V_4\dots$$

$$Q_{\text{eq}}=Q_1=Q_2=Q_3=Q_4\dots$$

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Capacitors in Parallel (branched)



$$C_{\text{eq}}=C_1+C_2+C_3+C_4\dots$$

$$V_{\text{total}}=V_1=V_2=V_3=V_4\dots$$

$$Q_{\text{eq}}=Q_1+Q_2+Q_3+Q_4\dots$$

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