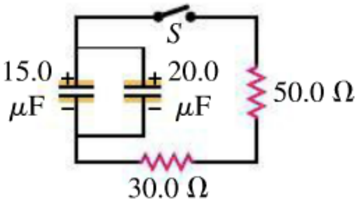
Practice Problem

26.43 •• **CP** In the circuit shown in **Fig. E26.43** both capacitors are initially charged to 45.0 V. (a) How long after closing the switch S will the potential across each capacitor be reduced to 10.0 V, and (b) what will be the current at that time?

Figure **E26.43**



Combine R's and C's

$R_{eq} = 80\Omega$

$C_{eq} = 35\mu F$

discharging $\rightarrow q(t) = Q(t=0)\, e^{-t/R_{eq}C_{eq}}$

$\rightarrow t = -RC \ln \frac{q(t)}{Q(t=0)} = -RC \ln\left(\frac{CV(t)}{CV(t=0)}\right) = -RC \ln \frac{V(t)}{V(t=0)}$

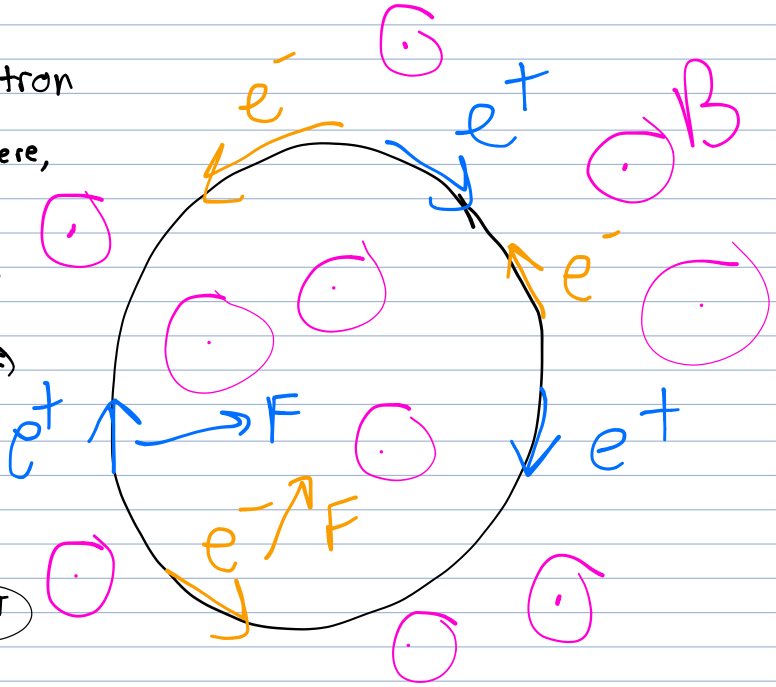
$= 80\Omega\, 35\mu F \ln \frac{10V}{45V} = \boxed{4.21\,ms}$

$i(t) = \frac{V_0}{R} e^{-t/RC} = \boxed{0.125A}$

Magnetism

$\vec{F} = q\vec{v} \times \vec{B}$

Cornell synchrotron



$\vec{F} = \frac{mv^2}{R}(-\hat{r})$ everywhere, for both e^- & e^+

What is B here?

$\vec{F} = q\vec{v} \times \vec{B} = \frac{mv^2}{R}(-\hat{r})$

$qvB \overset{1}{\cancel{\sin\theta}} (-\hat{r}) = \frac{mv^2}{R}(-\hat{r})$

$\rightarrow B = \frac{mv}{qR} = \boxed{0.16T}$

ActivPhysics 13.4

Q1 negative

Q2 CW

Q3 smaller $\boxed{R = \frac{mv}{qB}}$

Q4 shorter $T = \frac{\text{distance}}{\text{speed}} = \frac{2\pi R}{v} = \frac{2\pi m}{qB}$

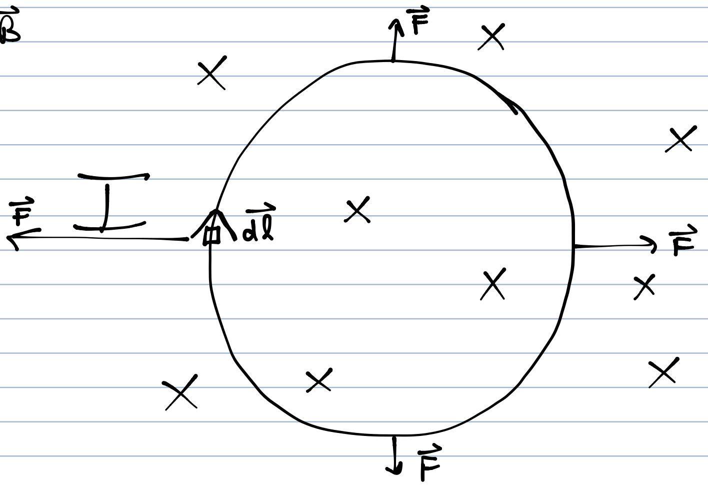
Q5 larger

Try these questions on your own!

The Cornell synchrotron involves several discrete bunches of e^- and e^+. What is the implication if it were a continual stream of e^-?

This would be a traditional current.

$d\vec{F} = I\, d\vec{l} \times \vec{B}$



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