1. Increase length → more material for current to flow through

Decrease area → less cross section for current to flow

Increase resistivity → harder for current to flow

2. $C_{eq} = 1/(1/5 + 1/(2+3))$

$= 5/2 = 2.5$

a. $RC = 10 \cdot 2.5 = \boxed{25\ s}$

b. $Q_{tot} = C_{eq} \cdot V$

$= 2.5 \cdot 10$

$= 25\ C$

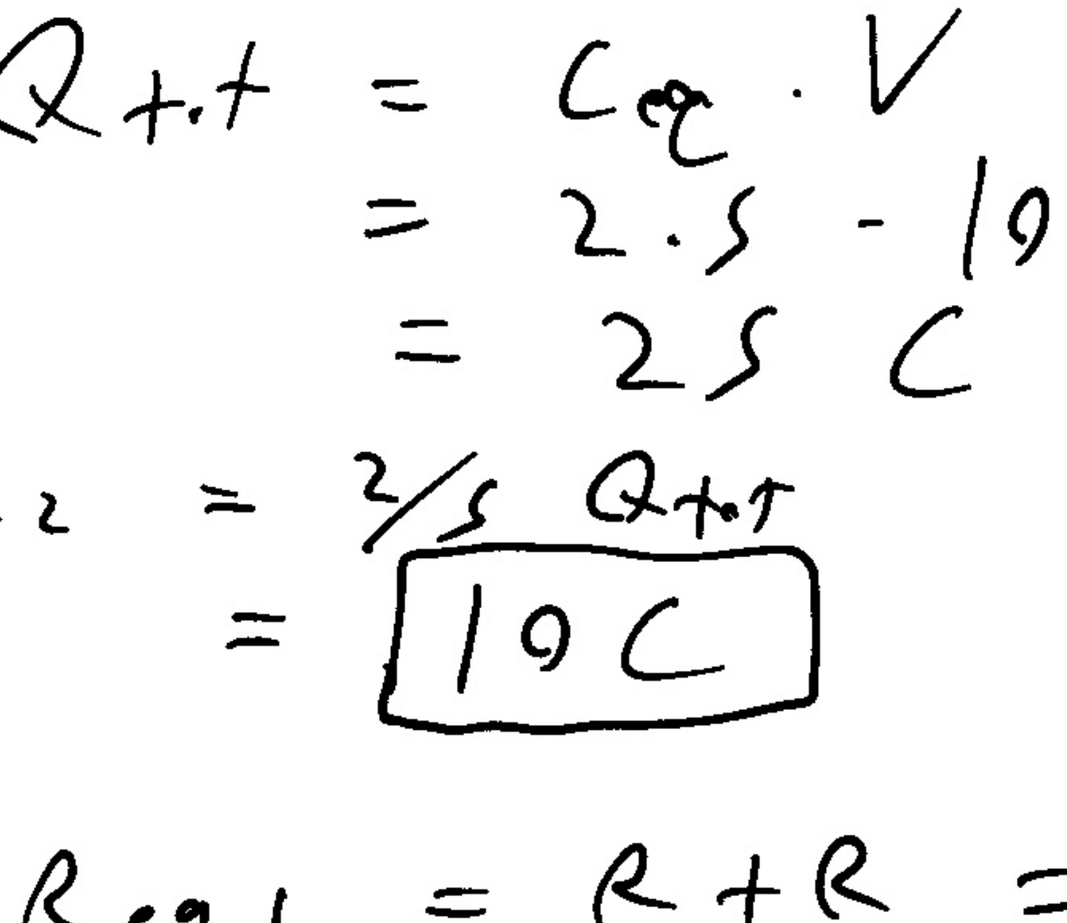
$Q_2 = 2/5\ Q_{tot}$

$= \boxed{10\ C}$

3. $R_{eq1} = R + R = 2\ \Omega$

$R_{eq2} = 1/(1/R + 1/R) = 1/2\ \Omega$

a.



b. $I_3 = I_2 + I_1$

c. $6 - 2 \cdot I_1 + 4_2 I_2 - 6 = 0$

$6 - 4_2 I_2 + 6 = 0$

d $12 = 4_2 I_2$

$\Rightarrow$ $\boxed{I_2 = 24\ A}$

$4_2 I_2 = 2 I_1$

$\Rightarrow$ $\boxed{I_1 = 6\ A}$

$I_3 = I_2 + I_1$

$= \boxed{30\ A}$

4. $\vec{\tau} = \vec{\mu} \times \vec{B}$

$\vec{\mu} = i A$ into board

$\vec{B} = \mu_0 \cdot I N / \ell$ for solenoid

so $|\vec{\tau}| = \boxed{\mu_0 i I A N / \ell}$

will rotate loop

so it aligns w/ current

in solenoid coils

5. a. $\vec{F} = I\vec{L} \times \vec{B}$

F on top and bottom are zero since +B, -B cancel

$$\vec{F}_{left} = IL\hat{j} \times (B_0 \cdot L/2 \cdot -\hat{k})$$

$$= -IB_0 L^2/2\, \hat{i}$$

$$\vec{F}_{right} = IL \cdot -\hat{j} \times B_0 L/2\, \hat{k}$$

$$= -IB_0 L^2/2\, \hat{i}$$

b. $\vec{F}_{net} = \vec{F}_L + \vec{F}_R$

$$= \boxed{-IB_0 L^2 \hat{i} \quad (+ \text{ left})}$$

Bonus: $F = \nabla(\vec{\mu} \cdot \vec{B})$

$$\vec{\mu} = -IL^2 \hat{k}$$

$$\vec{B} = B_0 x\, \hat{k}$$

$$\vec{\mu} \cdot \vec{B} = -IL^2 B_0 x$$

$$\nabla(\vec{\mu} \cdot \vec{B}) = \boxed{-IL^2 B_0 \hat{i}}$$