Suppose $\varepsilon = 12 \text{ V}$ and each lamp has $R = 2 \Omega$. Before the switch is closed the current is $\frac{12 \text{ V}}{6 \Omega} = 2 \text{ A}$. The potential difference across each lamp is $(2 \text{ A})(2 \Omega) = 4 \text{ V}$. The power of each lamp is $(2 \text{ A})(4 \text{ V}) = 8 \text{ W}$, totaling $24 \text{ W}$ for the circuit. Closing the switch makes the switch and the wires connected to it a zero-resistance branch. All of the current through A and B will go through the switch and (b) lamp C goes out, with zero voltage across it. With less total resistance, the (c) current in the battery $\frac{12 \text{ V}}{4 \Omega} = 3 \text{ A}$ becomes larger than before and (a) lamps A and B get brighter. (d) The voltage across each of A and B is $(3 \text{ A})(2 \Omega) = 6 \text{ V}$, larger than before. Each converts power $(3 \text{ A})(6 \text{ V}) = 18 \text{ W}$, totaling $36 \text{ W}$, which is (e) an increase.
(a) \[ R_p = \frac{1}{\left(\frac{1}{7.00 \ \Omega}\right) + \left(\frac{1}{10.0 \ \Omega}\right)} = 4.12 \ \Omega \]
\[ R_s = R_1 + R_2 + R_3 = 4.00 + 4.12 + 9.00 = 17.1 \ \Omega \]

(b) \[ \Delta V = IR \]
\[ 34.0 \ \text{V} = I(17.1 \ \Omega) \]
\[ I = \boxed{1.99 \ \text{A}} \text{ for } 4.00 \ \Omega, 9.00 \ \Omega \text{ resistors.} \]

Applying \( \Delta V = IR \), \( (1.99 \ \text{A})(4.12 \ \Omega) = 8.18 \ \text{V} \)
\[ 8.18 \ \text{V} = I(7.00 \ \Omega) \]
so \[ I = \boxed{1.17 \ \text{A}} \text{ for } 7.00 \ \Omega \text{ resistor} \]

\[ 8.18 \ \text{V} = I(10.0 \ \Omega) \]
so \[ I = \boxed{0.818 \ \text{A}} \text{ for } 10.0 \ \Omega \text{ resistor.} \]
We name the currents $I_1$, $I_2$, and $I_3$ as shown.

1. $70.0 - 60.0 - I_2(3.00 \, \text{k}\Omega) - I_1(2.00 \, \text{k}\Omega) = 0$

2. $80.0 - I_3(4.00 \, \text{k}\Omega) - 60.0 - I_2(3.00 \, \text{k}\Omega) = 0$

3. $I_2 = I_1 + I_3$

(a) Substituting for $I_2$ and solving the resulting simultaneous equations yields

$$I_1 = \boxed{0.385 \, \text{mA}} \quad \text{(through } R_1)$$

$$I_3 = \boxed{2.69 \, \text{mA}} \quad \text{(through } R_3)$$

$$I_2 = \boxed{3.08 \, \text{mA}} \quad \text{(through } R_2)$$

(b) $\Delta V_{cf} = -60.0 \, \text{V} - (3.08 \, \text{mA})(3.00 \, \text{k}\Omega) = \boxed{-69.2 \, \text{V}}$

Point $c$ is at higher potential.
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(a) \[ \tau = RC = \left( 1.50 \times 10^5 \ \Omega \right) \left( 10.0 \times 10^{-6} \ F \right) = 1.50 \ \text{s} \]

(b) \[ \tau = \left( 1.00 \times 10^5 \ \Omega \right) \left( 10.0 \times 10^{-6} \ F \right) = 1.00 \ \text{s} \]

(c) The battery carries current \[ \frac{10.0 \ \text{V}}{50.0 \times 10^3 \ \Omega} = 200 \ \mu\text{A}. \]

The 100 k\( \Omega \) carries current of magnitude \[ I = I_0 e^{-t/RC} = \left( \frac{10.0 \ \text{V}}{100 \times 10^3 \ \Omega} \right) e^{-t/1.00 \ \text{s}}. \]

So the switch carries downward current \[ 200 \ \mu\text{A} + \left( 100 \ \mu\text{A} \right) e^{-t/1.00 \ \text{s}}. \]
After steady-state conditions have been reached, there is no DC current through the capacitor.

Thus, for $R_3$:

$$I_{R_3} = 0 \text{ (steady-state)}.$$

For the other two resistors, the steady-state current is simply determined by the 9.00-V emf across the 12-k$\Omega$ and 15-k$\Omega$ resistors in series:

$$I_{(R_1+R_2)} = \frac{\varepsilon}{R_1 + R_2} = \frac{9.00 \text{ V}}{(12.0 \text{ k}\Omega + 15.0 \text{ k}\Omega)} = 333 \mu\text{A} \text{ (steady-state)}.$$  

After the transient currents have ceased, the potential difference across $C$ is the same as the potential difference across $R_2(=IR_2)$ because there is no voltage drop across $R_3$. Therefore, the charge $Q$ on $C$ is

$$Q = C(\Delta V)_{R_2} = C(IR_2) = (10.0 \mu\text{F})(333 \mu\text{A})(15.0 \text{ k}\Omega)$$

$$= 50.0 \mu\text{C}.$$