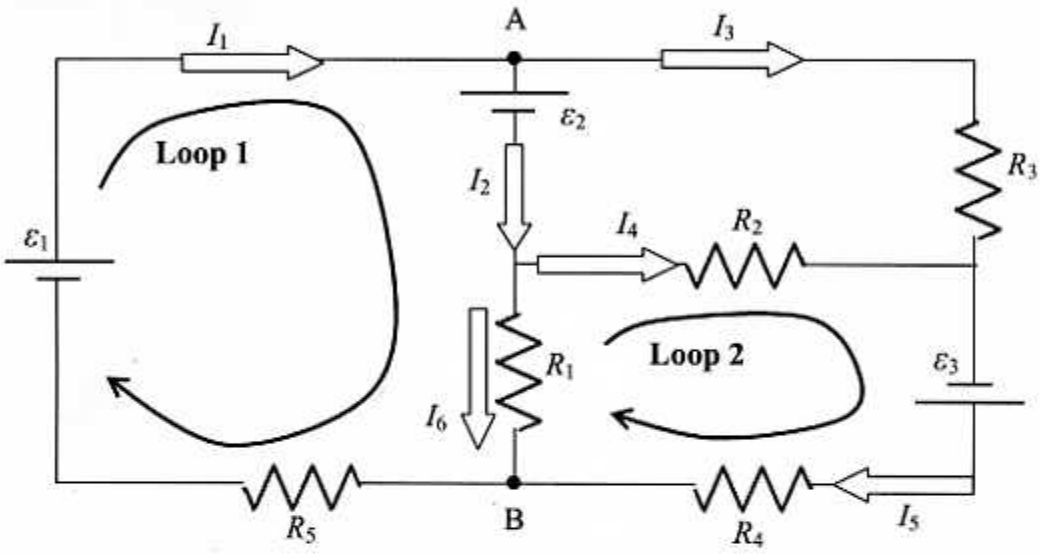
Name: _____ Section: ____

Tuesday, October 13

Quiz 7A

1. Consider the circuit below.



a. Write the equations that correspond to the two loops indicated in the figure.

(1) $\mathcal{E}_1 - \mathcal{E}_2 - I_6R_1 - I_1R_5 = 0$

(2) $\mathcal{E}_2 - I_5R_4 + I_6R_1 - I_4R_2 = 0$

b. Write the junction equations for points A and B.

(A) $I_1 = I_2 + I_3$

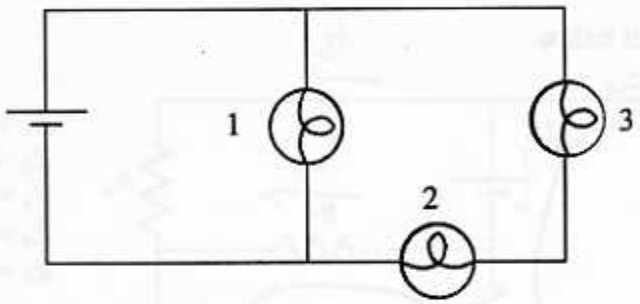
(B) $I_6 + I_5 = I_1$

TURN OVER!!!

2. The bulbs in the circuit below are identical. Rank them from lowest to highest in terms of:

   a. The magnitude of the potential difference across each bulb
   b. The brightness

   You must show your reasoning and/or calculations.



a) $V_1 = V_{23} = V_2 + V_3$

and $V_2 = V_3$ because $i_2 = i_3$ and they have identical resistances.

$$\boxed{V_2 = V_3 < V_1}$$

b) Since brightness $\propto P = \frac{V^2}{R}$

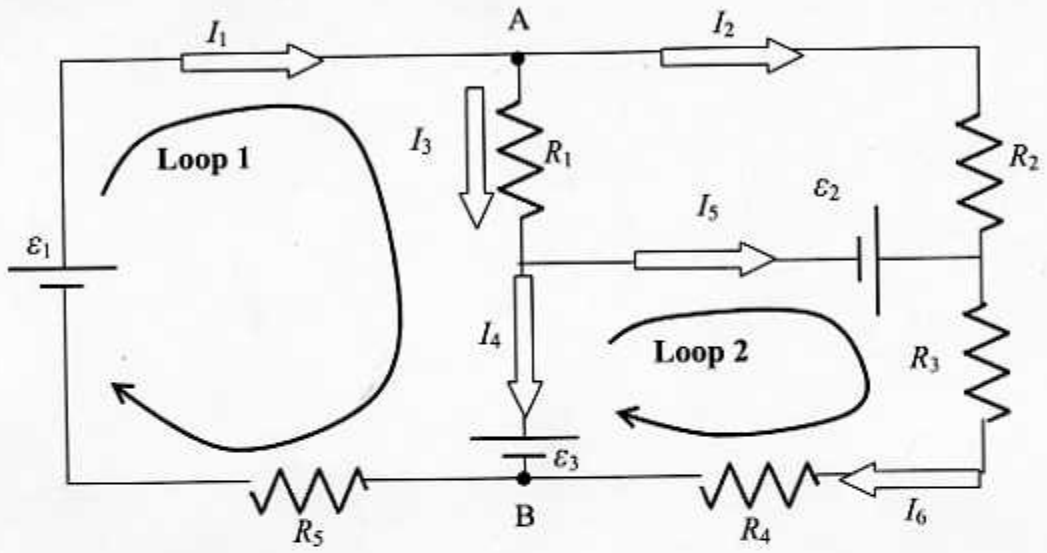
$$\boxed{P_2 = P_3 < P_1}$$

Name: _____ Section: ____

Tuesday, October 13

Quiz 7B

1. Consider the circuit below.



a. Write the equations that correspond to the two loops indicated in the figure.

(1) $\varepsilon_1 - I_3R_1 - \varepsilon_3 - I_4R_5 = 0$

(2) $\varepsilon_2 - I_6(R_3 + R_4) + \varepsilon_3 = 0$

b. Write the junction equations for points A and B.

(A) $I_1 = I_2 + I_3$

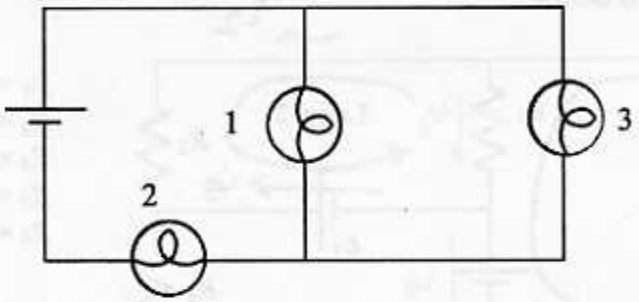
(B) $I_4 + I_6 = I_1$

TURN OVER!!!

2. The bulbs in the circuit below are identical. Rank them from lowest to highest in terms of:

   a. The magnitude of the potential difference across each bulb
   b. The brightness

   You must show your reasoning and/or calculations.



a) Current through ② splits to go through ① and ③

$$i_1 = i_3 = \frac{i_2}{2}$$

Since $V_i = R i_i$ (R = resistance of each bulb)

$$V_1 = V_3 = \frac{V_2}{2}$$

$$\boxed{V_1 = V_3 < V_2}$$

b) Brightness $\propto P = \frac{V^2}{R}$, so

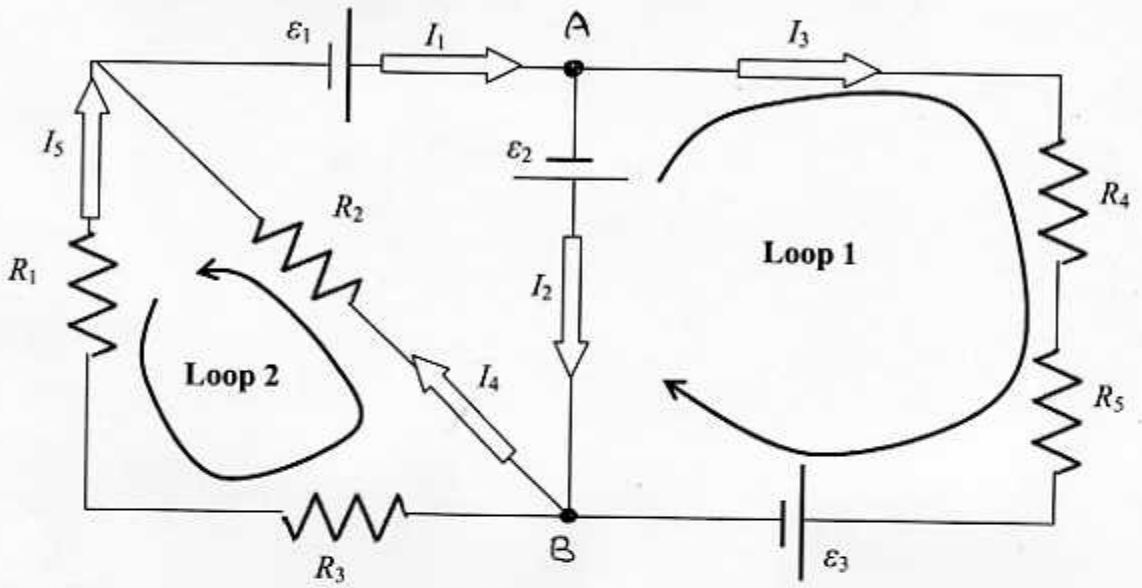
$$\boxed{P_1 = P_3 < P_2}$$

Name: _____ Section: ____

Tuesday, October 13

Quiz 7C

1. Consider the circuit below.



a. Write the equations that correspond to the two loops indicated in the figure.

(1) $-I_3(R_4+R_5) - \varepsilon_3 - \varepsilon_2 = 0$

(2) $I_5(R_1+R_3) - I_4R_2 = 0$

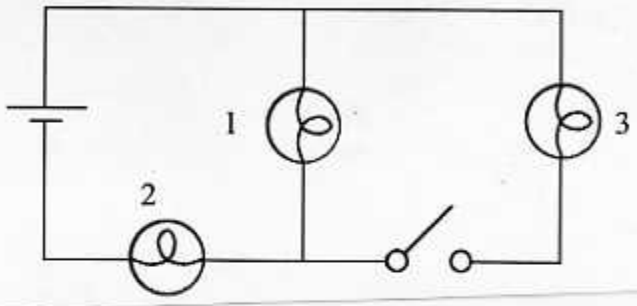
b. Write the junction equations for points A and B.

(A) $I_1 = I_3 + I_2$

(B) $I_3 + I_2 = I_4 + I_5$

TURN OVER!!!

2. The circuit below has three identical bulbs and the switch is initially open. Explain what happens to the brightness of bulb 2 when the switch is closed. You must show your reasoning and/or calculations.



Switch open: both bulbs are equally bright (R is the same for both and current is the same because they are in series)

Switch closed: now ① and ③ are in parallel, so overall ①+③ has less resistance. If the whole Ref is less, current through ② increases

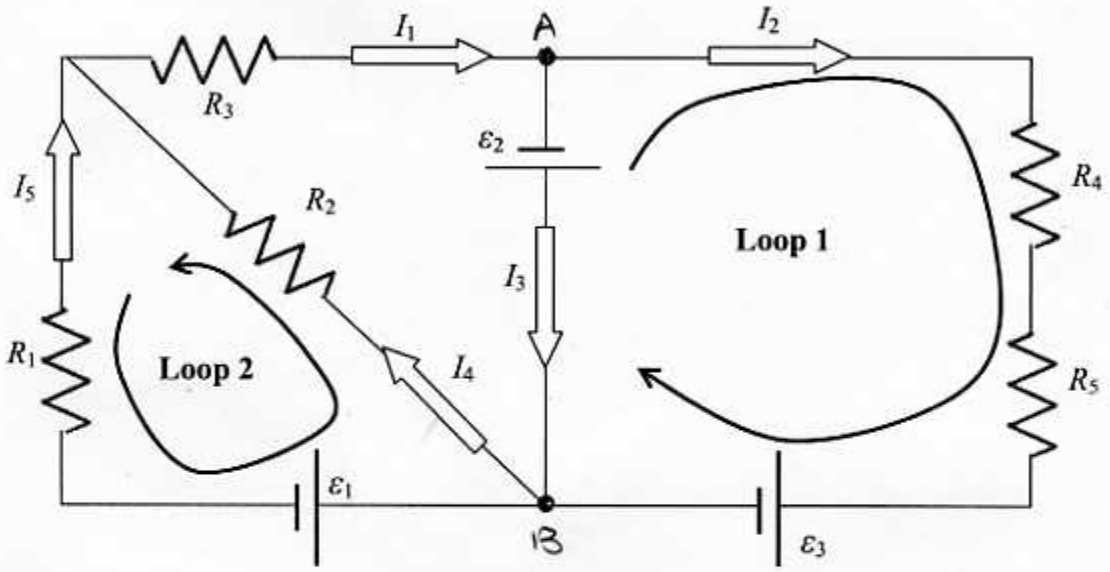
⇒ ② is brighter

Name: _____ Section: ____

Tuesday, October 13

Quiz 7D

1. Consider the circuit below.



a. Write the equations that correspond to the two loops indicated in the figure.

(1) $-I_2(R_4+R_5) - \varepsilon_3 - \varepsilon_2 = 0$

(2) $\varepsilon_1 - I_4R_2 + I_5R_1 = 0$

b. Write the junction equations for points A and B.

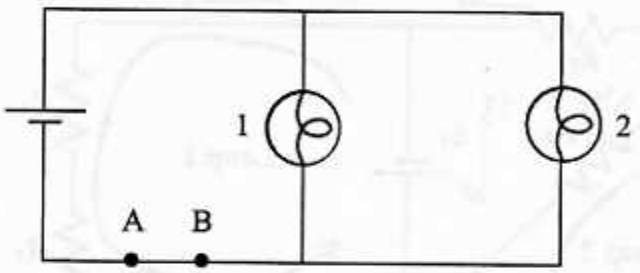
(A) $I_1 = I_2 + I_3$

(B) $I_3 + I_2 = I_4 + I_5$

TURN OVER!!!

2. The circuit below has initially two identical bulbs 1 and 2. A third bulb is then inserted between points A and B.
   a. What happens to the brightness of 1 and 2?
   b. Compare the brightness of bulb 1 to that of the third bulb.

   You must show your reasoning and/or calculations.



a) Placing a bulb between A and B increases the resistance of the system, so it decreases the current. Therefore, both ① and ② will be dimmer than before.

b) The third bulb gets more current than ① or ② ($I_3 = I_1 + I_2 = 2I_1 = 2I_2$), so ③ is brighter than ①