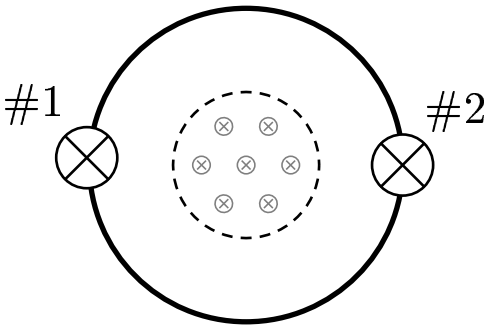
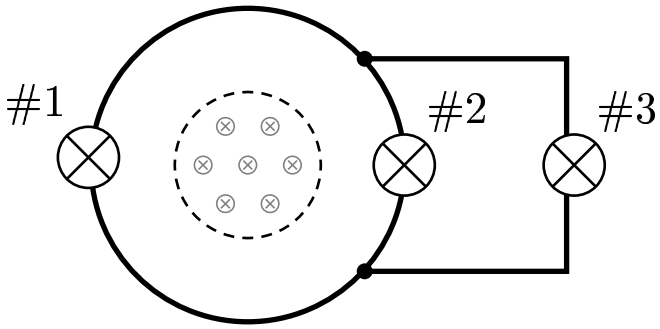
A solenoid is producing the same steadily increasing magnetic flux through two circular circuits shown below.

Case A: Two identical bulbs #1 and #2 are in series. Each has a resistance R. Their brightnesses (or their electric power) are the same, *i.e.* $P_1 = P_2$.

Case B: Bulbs #2 and #3 are in parallel, and the bulbs #2 and #3 are in series with the bulb #1. Each bulb has a resistance R. We label the respective electric powers of the bulbs by P_1', P_2' and P_3'.



Case A



Case B

Compare the power of bulbs #1 for two cases.

A) $P_1' < P_1$ $B)$ $P_1' = P_1$ $C)$ $P_1' > P_1$

For case A, denote the current I. The loop equation is $\mathcal{E} - 2\,I\,R = 0$, or $I = \dfrac{\mathcal{E}}{2\,R}$. For case B, label currents through the bulbs by I'_1, I'_2 and I'_3 respectively. By symmetry $I'_2 = I'_3$. Since $I'_1 = I'_2 + I'_3$, then $I'_1 = 2\,I'_2$. This leads to the loop equation: $\mathcal{E} - I'_1\,R - I'_2\,R = \mathcal{E} - \dfrac{3}{2}\,I'_1\,R = 0$. Solving for I'_1 gives: $I'_1 = \dfrac{2}{3}\,\dfrac{\mathcal{E}}{R} = \dfrac{2}{3}\,(2I) = \dfrac{4}{3}\,I$. Here $I'_1 > I$, so $P'_1 > P_1$.

Answer **C**.

31.04-03˙Three˙Light˙Bulbs˙with˙a˙Pair˙in˙Parallel 2006-9-14