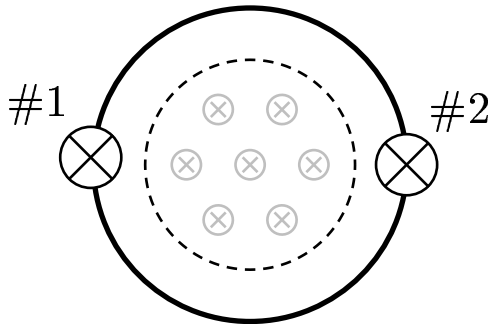


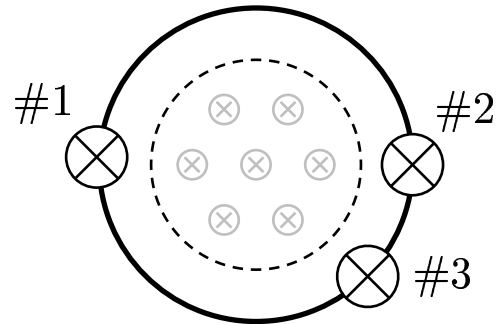
A solenoid is producing a same steadily increasing magnetic flux through two circular circuits shown below.

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

Case B: Three bulbs are in series, each with a resistance R . #3 is close to #2. Electric powers are labeled by P'_1 , P'_2 and P'_3 .



Case A



Case B

Compare the powers of bulbs #1 and #2.

- A) $P'_1 = P_1$ and $P'_1 = P'_2$.
- B) $P'_1 = P_1$ and $P'_1 > P'_2$.
- C) $P'_1 < P_1$ and $P'_1 = P'_2$.
- D) $P'_1 < P_1$ and $P'_1 > P'_2$.

For case A, denote the current I . The loop equation gives $\mathcal{E} - 2 I R = 0$,

or $I = \frac{\mathcal{E}}{2 R}$. Correspondingly for case B, $\mathcal{E} = 3 I' R$, or $I' = \frac{\mathcal{E}}{3 R} = \frac{2}{3} I$. Since

$I' < I$, $P'_1 < P_1$. Bulb #1 and bulb #2 are in series, so $P'_1 = P'_2$.

Answer **C**.

31.04-02 Light Bulbs in Series 2004-3-24