Q. 23 A 25 W and a 100 W bulb are joined in series and connected to the mains. Which bulb will glow brighter? (1979)

Sol. Let the powers of the bulbs, $P_1 = 25$ W and $P_2 = 100$ W, be specified at a voltage V. The resistances of the bulbs are $R_1 = V^2/P_1$ and $R_2 = V^2/P_2$. When connected in series, the currents through the bulbs are equal, say i. The powers consumed by the bulbs, connected in the series, are

$$P_1' = i^2 R_1 = i^2 V^2/P_1 = \tfrac{1}{25} i^2 V^2, \quad (1)$$

$$P_2' = i^2 R_2 = i^2 V^2/P_2 = \tfrac{1}{100} i^2 V^2. \quad (2)$$

From equations (1) and (2), $P_1' = 4P_2'$. Hence, the bulb with 25 W power will glow brighter.

Ans. 25 W ⊡