

23. (a) Let \mathcal{E} be the emf of the battery. When the bulbs are connected in parallel, the potential difference across them is the same and is also the same as the emf of the battery. The power dissipated by bulb 1 is $P_1 = \mathcal{E}^2/R_1$, and the power dissipated by bulb 2 is $P_2 = \mathcal{E}^2/R_2$. Since R_1 is greater than R_2 , bulb 2 dissipates energy at a greater rate than bulb 1 and is the brighter of the two.
- (b) When the bulbs are connected in series the current in them is the same. The power dissipated by bulb 1 is now $P_1 = i^2 R_1$ and the power dissipated by bulb 2 is $P_2 = i^2 R_2$. Since R_1 is greater than R_2 , greater power is dissipated by bulb 1 than by bulb 2 and bulb 1 is the brighter of the two.