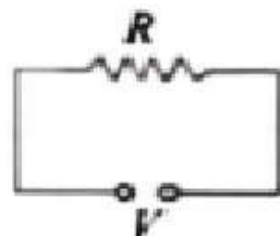## Q 18

A wire when connected to 220 V mains supply has power dissipation P_1. Now the wire is cut into two equal pieces which are connected in parallel to the same supply. Power dissipation in this case is P_2. Then $P_2 : P_1$ is [2002]
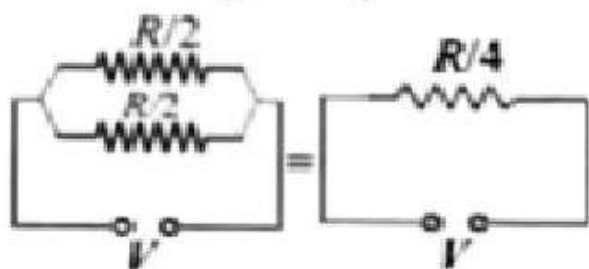
(a) 1 (b) 4 (c) 2 (d) 3

(b) Case 1: $P_1 = \dfrac{V^2}{R}$

Case 2: The wire is cut into two equal pieces. Therefore, the resistance of the individual wire is $\dfrac{R}{2}$. These are connected in parallel

$$\therefore R_{eq} = \dfrac{R/2}{2} = \dfrac{R}{4}$$

$$\therefore P_2 = \dfrac{V^2}{R/4} = 4\left(\dfrac{V^2}{R}\right) = 4P_1$$