(a) Calculate resistance of each filament:

\[ P_1 = I_1^2 R_1 = \frac{V_1^2}{R_1} = \frac{(120V)^2}{R_1} \Rightarrow R_1 = \frac{(120V)^2}{I_1} \]

\[ R_1 = 240 \, \Omega \]

In parallel, so \( V_1 = V_2 = 120V \).

As above,

\[ P_2 = \frac{V_2^2}{R_2} \Rightarrow R_2 = \frac{(120V)^2}{120W} \]

\[ R_2 = 120 \, \Omega \]

If put them in parallel what power do we get?

\[ P_{\text{tot}} = \frac{V^2}{R_{\text{eq}}} = \frac{(120V)^2}{\left(\frac{1}{R_1} + \frac{1}{R_2}\right)} = \frac{(120V)^2}{\left(\frac{1}{240 \, \Omega} + \frac{1}{120 \, \Omega}\right)} = \frac{(120V)^2}{80.5 \, \Omega} \]

\[ P_{\text{tot}} = 180 \, W \]

(b) Suppose higher resistance filament burns out.

How much power will bulb dissipate on each brightness setting?

- If \( R_2 \) (60W) burns out, 60W setting doesn't work.

For higher resistance (240W) - low current - less power (50W)

- The 240W setting stays same since 120W filament still works.

- The 120W setting now only gives 120W.

So, in a three-switch circuit, the lamp where you used to get 60W, 120W, 180W, you now get 120W, 120W, 120W when you twist it.
If the bulb burns out (100W), the wire filament still works. If lower resistance (125R), more current.

So the bulb output gives 20.5W instead of 60/120, (20W).