

HW 21 #4, 6, 11, 13, 15 Alexedn

4a) $P = VI$, $I = \frac{P}{V}$

toaster = $\frac{1800}{120} = 15 \text{ A}$

frying pan = $\frac{1400}{120} = 11.6 \text{ A}$

lamp = $\frac{25}{120} = 0.625 \text{ A}$

b) Yes, because the sum of current (due to it being a parallel circuit) is 27.15 A.

6a) $V = IR$, $I = \frac{V}{R}$, $P = I^2 R$

$R_{\text{total}} = 24 + 96 = 120 \Omega$

$I = \frac{48}{120} = 0.4 \text{ A}$ (for both $\frac{1}{2}$ series)

$P = 0.4^2 \cdot 24 = 3.84 \text{ W}$

$P = 0.4^2 \cdot 96 = 15.4 \text{ W}$

b) 24Ω current = $\frac{48}{24} = 2 \text{ A}$

96Ω current = $\frac{48}{96} = 0.5 \text{ A}$

24Ω power = $\frac{48^2}{24} = 96 \text{ W}$

96Ω power = $\frac{48^2}{96} = 24 \text{ W}$

11) $R_1 \gg R_2$

series: $R_{\text{total}} = R_1 + R_2 \approx R_1$

parallel: $R_{\text{total}} = \frac{1}{(\frac{1}{R_1} + \frac{1}{R_2})} = \frac{1}{(\frac{R_2 + R_1}{R_1 R_2})} = \frac{R_1 R_2}{R_2 + R_1} \approx \frac{R_1 R_2}{R_1} = R_2$

13a) $R_{\text{total}} = R_1 + R_2$, $R_2 = R_{\text{total}} - R_1 = 0.5 \text{ e6} - 900 \text{ e3} = -400 \text{ e3} \Omega$

b) The resistance is negative

c) R_{total} is too small / R_1 is too large

15a) $9 / 1.54 = 5.844 \approx 6 \text{ cells}$

b) $6 \cdot 1.54 = 9.24 \text{ V}$

c) Internal resistance will lower terminal voltage