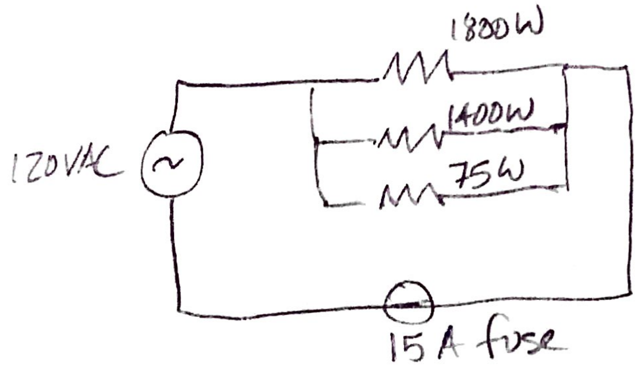
10.28

Devices are connected in parallel:



a) Current drawn by each device?

$P = IV \rightarrow 1800W = I(120V)$

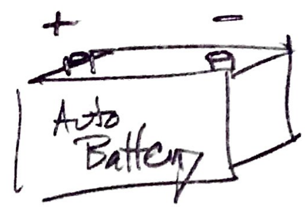
$I = \frac{1800}{120} = \boxed{15A}$ toaster.

$I_{speaker} = \frac{1400W}{120} = \boxed{11.7A}$

$I_{lamp} = \frac{75}{120} = \boxed{0.625A}$

b) The speaker & the lamp together would need 12.3 A, & that's fine. But that toaster is 15 A all by itself. It in combination with anything else will cause too much current to flow, & the fuse/circuit breaker will blow.

10.25



$V_{terminal} = 16.0V$ during charging
$I = 10.0A$
$\mathcal{E}$ for battery is $12.0V$, so

a) $V_{terminal} = \mathcal{E} - Ir$
$16V = 12 - (10A)r$

When battery is being charged current flows in the opposite direction that it is delivered, so

$16V = 12 - (-10)r$

$\frac{16-12}{10} = r = \boxed{0.40\,\Omega}$

b) Power dissipated (using resistance)
$= I^2R = (10A)^2(0.40\,\Omega) = \boxed{40\,W}$

c) At what rate will temperature increase (°C/min) if $m = 20.0\,kg$ & specific heat $C = 0.300\,kcal/kg\,°C$?

$Q = mC\Delta T$! :)

$P = \frac{Q}{t}$, so $P = \frac{mC\Delta T}{t}$

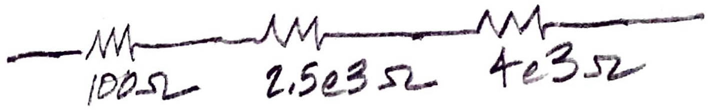
$40\frac{J}{s} = (20\,kg)(0.300\frac{kcal}{kg\,°C})\frac{\Delta T}{t}$

$\frac{1\,\cancel{cal}}{4.184\,\cancel{J}} \times 40\frac{\cancel{J}}{s} = 6000\frac{\cancel{cal}}{°} \frac{\Delta T}{t} \times \cancel{\frac{60\,s}{min}}$

$\frac{\Delta T}{s} = \frac{40}{4.184 \times 6000} = 0.00159\,\frac{°C}{s} \times \frac{60\,s}{min} =$

$\boxed{9.56 \times 10^{-2}\,°C/min}$

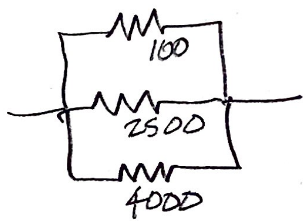
10.26



a) In series, $R_{equivalent} = R_1 + R_2 + R_3$

$= \begin{array}{r} 100 \\ 2500 \\ \underline{4000} \\ \boxed{6600\ \Omega} \end{array}$

b) In parallel, $\dfrac{1}{R_{equivalent}} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \dfrac{1}{R_3}$



$R_{equivalent} = \boxed{93.9\ \Omega}$