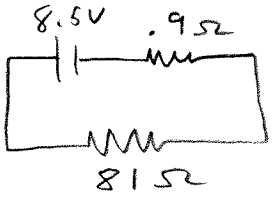
p547 1, 3, 12, 14, 15, 18, 22

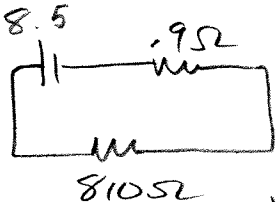
(1) (a)



$I = \frac{V}{R} = \frac{8.5V}{81.9\Omega} = 0.104\ A$

$V = IR = (0.104\ A)(81\Omega) = \underline{8.41V}$

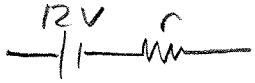
(b)



$I = \frac{V}{R} = \frac{8.5V}{810.9\Omega} = 0.0105\ A$

$V = IR = (0.0105\ A)(810\Omega) = \underline{8.49V}$

(3)



$V_r = 12 - 8.4 = 3.6V$

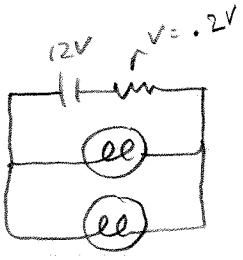
$r = \frac{V}{I} = \frac{3.6V}{75A} = \underline{0.048\Omega}$

$I = 75A$

$V = 8.4V$

$R = \frac{V}{I} = \frac{8.4V}{75A} = \underline{0.112\ \Omega}$

(12)



V across light bulbs = 11.8V

I in circuit = sum of I in light bulbs

$P = IV$

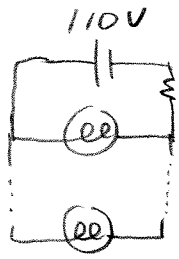
$I = \frac{P}{V} = \frac{3W}{12V} = 0.25\ A$

∴ current through internal resistance, r is

$0.25A + 0.25A = 0.50A$

$r = \frac{V}{I} = \frac{0.2V}{0.5A} = \underline{0.40\ \Omega}$

(14)



Total Current = $\sum I_{lightbulbs}$
= 8(250 mA) = 2 A

$\therefore V_{lightbulb} = 110\,V - 3.2\,V = 106.8\,V$

$R_{lightbulbs} = \frac{V}{I} = \frac{106.8\,V}{2\,A} = 53.4\,\Omega$

lightbulbs are in parallel

$\frac{1}{R_{lightbulbs}} = \sum \frac{1}{R} = \frac{8}{R}$

$R = 8(R_{lightbulbs}) = 8(53.4\,\Omega) = 427.2 = \underline{430\,\Omega}$

$P_{lead} = I_{lead} V_{lead} = (2A)(3.2V) = \underline{6.4\,W}$

(15) Voltage through each bulb is $\frac{V_{total}}{8}$ (bulbs are in series)

$V_b = \frac{110\,V}{8} = 13.75\,V$

$P_b = \frac{V^2}{R_{bulb}}$

$R_{bulb} = \frac{V^2}{P} = \frac{(13.75V)^2}{7.0\,W} = \underline{275\,\Omega}$

(18) $P = \frac{V^2}{R}$

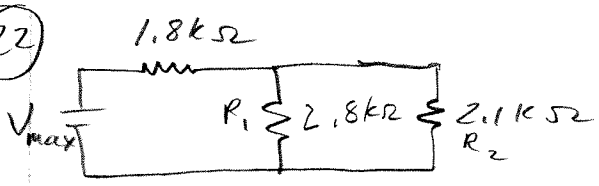
Bulb 1: $R = \frac{V^2}{P} = \frac{(110V)^2}{75W} = 161.3\,\Omega$

Bulb 2: $R = \frac{V^2}{P} = \frac{(110V)^2}{40W} = 302.5\,\Omega$

$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{161.3\,\Omega} + \frac{1}{302.5\,\Omega}$

$\underline{R = 110\,\Omega}$

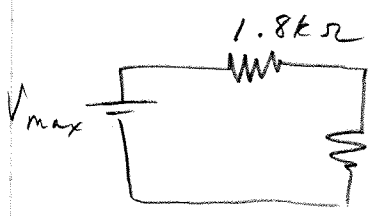
(22)



$P_1 = I_1^2 R_1$

$I_1 = \sqrt{\frac{P_1}{R_1}} = \sqrt{\frac{.5W}{2.8k\Omega}} = 0.013\,A$

$I_2 = \sqrt{\frac{P_2}{R_2}} = \sqrt{\frac{.5W}{2.1k\Omega}} = 0.015\,A$



$I = 0.028\,A$

$V = 50.4V$

$I = I_1 + I_2 = 0.028\,A$

$V = 33.6V$

$V_{max} = 50.4V + 33.6V = \underline{84V}$