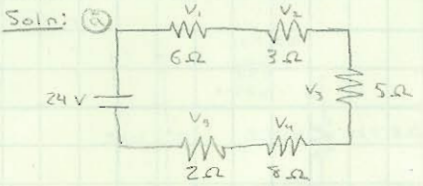
23. Given: resistance and voltage

Reqd: voltage across resistors

Soln: (a)



$V_1 = 24V\left(\frac{6\Omega}{24\Omega}\right) \rightarrow \boxed{V_1 = 6\ V}$ $V_4 = 24V\left(\frac{8\Omega}{24\Omega}\right) \rightarrow \boxed{V_4 = 8\ V}$

$V_2 = 24V\left(\frac{3\Omega}{24\Omega}\right) \rightarrow \boxed{V_2 = 3\ V}$ $V_5 = 24V\left(\frac{2\Omega}{24\Omega}\right) \rightarrow \boxed{V_5 = 2\ V}$

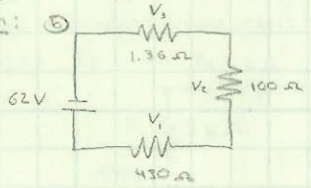
$V_3 = 24V\left(\frac{5\Omega}{24\Omega}\right) \rightarrow \boxed{V_3 = 5\ V}$

KVL → $24 = 6 + 3 + 5 + 8 + 2 = 24$ ✓

24. Given: voltage and resistance

Reqd: voltage across resistors

Soln: (b)



$V_1 = 62V\left(\frac{430\Omega}{531.36\Omega}\right) \rightarrow \boxed{V_1 = 50.2\ V}$

$V_2 = 62V\left(\frac{100\Omega}{531.36\Omega}\right) \rightarrow \boxed{V_2 = 11.7\ V}$

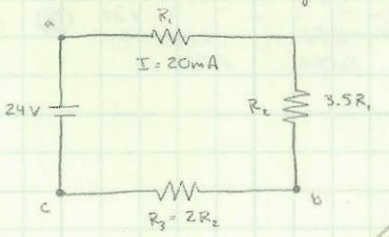
$V_3 = 62V\left(\frac{1.36\Omega}{531.36\Omega}\right) \rightarrow \boxed{V_3 = 158.7\ mV}$

KVL → $62 \cong 50.2 + 11.7 + 0.16 = 61.86$ ✓

25. Given: power, resistance and voltage

Reqd: unknown resistors, voltage across resistors, power dissipated by resistors

Soln:



(a) $R_t = R_1 + 3.5R_1 + 7R_1 \rightarrow R_t = 11.5\ R_1$

$R_1 = \frac{V_1}{I} \rightarrow R_1 = \frac{2.09\ V}{.02\ A} \rightarrow \boxed{R_1 = 104.5\ \Omega}$

$R_2 = 3.5(104.5\Omega) \rightarrow \boxed{R_2 = 365.8\ \Omega}$

$R_3 = 2(365.8\ \Omega) \rightarrow \boxed{R_3 = 731.6\ \Omega}$

(b) $V_1 = 24V\left(\frac{R_1}{11.5R_1}\right) \rightarrow \boxed{V_1 = 2.09\ V}$

$V_2 = 24V\left(\frac{365.8\ \Omega}{1201.9\ \Omega}\right) \rightarrow \boxed{V_2 = 7.30\ V}$

$V_3 = 24V\left(\frac{731.6\ \Omega}{1201.9\ \Omega}\right) \rightarrow \boxed{V_3 = 14.6\ V}$

(c) $P_1 = \frac{V_1^2}{R_1} \rightarrow P_1 = \frac{(2.09)^2}{104.5} \rightarrow \boxed{P_1 = 41.8\ mW}$

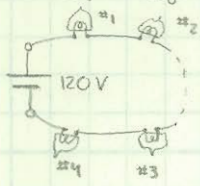
$P_2 = \frac{V_2^2}{R_2} \rightarrow P_2 = \frac{(7.03)^2}{365.8} \rightarrow \boxed{P_2 = 146\ mW}$

$P_3 = \frac{V_3^2}{R_3} \rightarrow P_3 = \frac{(14.6)^2}{731.6} \rightarrow \boxed{P_3 = 291\ mW}$

27. Given: power, resistance

Reqd: current, voltage across lights, power dissipated

Soln:



R = 25Ω / light bulb

(a) $V = IR \rightarrow I = \frac{V}{R} \rightarrow I = \frac{120\ V}{600\ \Omega} \rightarrow \boxed{I = 200\ mA}$

(b) $V = 120V\left(\frac{25\Omega}{600\Omega}\right) \rightarrow \boxed{V = 5\ V}$

(c) $P = I^2R \rightarrow P = (.2\ A)^2(25\ \Omega) \rightarrow \boxed{P = 1\ W}$

(d) $R_t = 22(25\Omega)$ $R_t = 550\ \Omega$ $I = \frac{120\ V}{550\ \Omega} \rightarrow \boxed{I = 218\ mA}$

$P = (.218\ A)^2(25\Omega)$ $\boxed{P = 1.2\ W}$

$V = 120V\left(\frac{25\ \Omega}{550\ \Omega}\right) \rightarrow \boxed{V = 5.5\ V}$

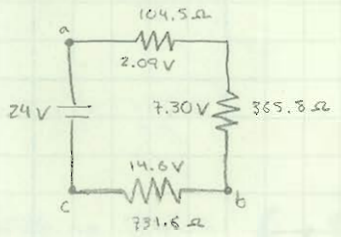
(e) life expectancy would decrease

HW #6

29. Given: power, voltage, resistance, power dissipated

Reqd: voltages V_{ab} & V_{bc}

Soln:



$V_{ab} = 2.09\,V + 7.30\,V$

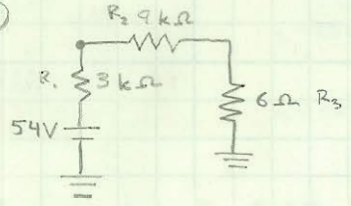
$\boxed{V_{ab} = 9.39\,V}$

$\boxed{V_{bc} = 14.6\,V}$

31. Given: resistance

Reqd: voltage across resistors and V_a

Soln: (a)



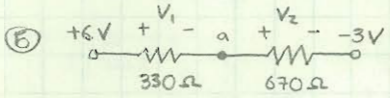
$V_1 = 54\,V\left(\frac{3000\,\Omega}{18000\,\Omega}\right) \rightarrow \boxed{V_1 = 9\,V}$

$V_2 = 54\,V\left(\frac{9000\,\Omega}{18000\,\Omega}\right) \rightarrow \boxed{V_2 = 27\,V}$

$V_3 = 54\,V\left(\frac{6000\,\Omega}{18000\,\Omega}\right) \rightarrow \boxed{V_3 = 18\,V}$

$V_a = 54\,V - 9\,V \rightarrow \boxed{V_a = 45\,V}$

(b)



$V_1 = 9\,V\left(\frac{330\,\Omega}{1000\,\Omega}\right) \rightarrow \boxed{V_1 = 2.97\,V}$

$V_2 = 9\,V\left(\frac{670\,\Omega}{1000\,\Omega}\right) \rightarrow \boxed{V_2 = 6.03\,V}$

$V_a = 6\,V - 2.97\,V \rightarrow \boxed{V_a = 3.03\,V}$