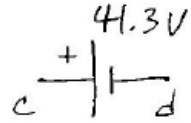
P1.11. (a) $+16.1 + v_{ab} + 12.9 = 0 \Rightarrow v_{ab} = -29\,V$

(b) $+16.1 + 12.3 + 12.9 + v_{dc} = 0 \Rightarrow v_{dc} = -41.3\,V$



P1.14. $-i_1 + (-3) + (+8) = 0 \Rightarrow i_1 = +5A$

$-(+10) + i_2 + 8 = 0 \Rightarrow i_2 = +2A$

$v_{ad} + 8 - 20 - (-5) = 0 \Rightarrow v_{ad} = +7\,V$

$v_x - 20 - (-5) + 3 = 0 \Rightarrow v_x = +12\,V$

P1.16. $+v_2 + 12 - 10 = 0 \Rightarrow v_2 = -2\,V$

(a) $-25 + v_1 + 10 = 0 \Rightarrow v_1 = +15\,V$

$-5 + i + 5.6 = 0 \Rightarrow i = -0.6\,A$

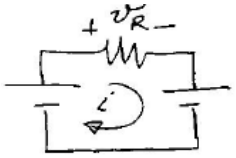
(b) $p_{25} = 25 \times 5 = 125\,W$

$p_{12} = -(12)(-0.6) = +7.2\,W$ } $P_{out} = 125 + 7.2 = 132.2\,W$

$p_{R_1} = +v_1 \times 5 = +(15) \times 5 = +75\,W$

$p_{R_2} = +v_2(-0.6) = +(-2)(-0.6) = +1.2\,W$ } $p_{in} = 132.2\,W$

$p_{R_3} = +10(5.6) = 56\,W$

P1.18 

$+5i = 10W \Rightarrow i = +2A$

$p_9 = +9 \times 2 = +18W$

$-9 + v_R + 5 = 0 \Rightarrow v_R = 4V \Rightarrow p_R = +4 \times 2 = +8W$

P1.26. (a) double pole

(b) double throw

(c) $V_{out} = \pm V_{in}$ (+ : a, − : b)

P1.27. For ON

	SW 1	SW 2
	a	c
	b	d

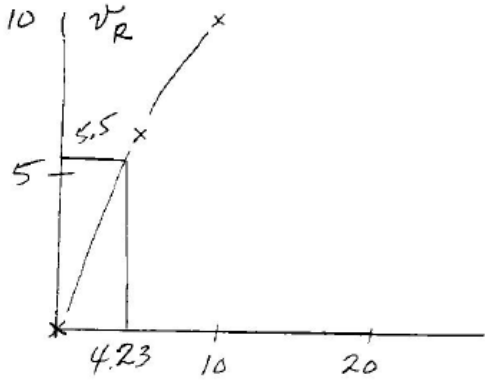
(b) it goes OFF

(c) it goes ON

P1.32. $v(R) = 25 \times \frac{R}{R+15}$

$5.5 = 25 \times \frac{1}{1 + 15/R}$

$\frac{15}{R} = 3.55 \Rightarrow R = 4.23\Omega$



P1.35. (a) $0.5 = 5 \times \dfrac{\frac{1}{R}}{\frac{1}{R}+\frac{1}{150}}$ so $\frac{1}{R}+\frac{1}{150} = \frac{10}{R}$

$R = 150 \times 9 = 1350\,\Omega$

(b) $i^2 R = 833$

$\left(\dfrac{5/R}{\frac{1}{R}+\frac{1}{150}}\right)^2 \times R = 833 \Rightarrow \frac{1}{R} = \frac{833}{25}\left(\frac{1}{R}+\frac{1}{150}\right)^2$. Let $1/R = x$

$x = 33.3\left(x^2 + \frac{x}{75} + \left(\frac{1}{150}\right)^2\right)$

(c) next page $\quad x = 1.33\times10^{-2}\,(R = 74.9\,\Omega)$ or $3.33\times10^{-3}\,(300\,\Omega)$

P1.39. (a) For $R=0$; $R_{eq} = R_1 = 30\,\Omega$

For $R=\infty$, $R_{eq} = R_1 + R_2 = 75\,\Omega \Rightarrow R_2 = 45\,\Omega$

(b) $45 \| R = 22.5 \Rightarrow R = 45\,\Omega$

P1.41. (a) $i = \dfrac{15}{5\|7.5+10} = 1.15\text{ A}$

(b) $i = \underbrace{\dfrac{36}{75+100\|150}}_{0.267\text{ A} \times 75\,\Omega = v = +20\text{ V}} \times \dfrac{100\|150}{100} = 0.160\text{ A}$

(c) $v = 0.5 \times \left(5\|10\|35\right) \times \dfrac{20}{20+15} = 0.870\text{ V}$

(d) $v = -2 \times (6\|6) \times \dfrac{5}{5+1} = -5\text{ V}$

P1.50 (a) $R_{eq} = 2R \| 2R = R$ since no current flows in middle resistor

(b) $R_{eq} = (R\|R + R\|R)\|R = R/2$ since no current flows in farthest R

(c) $R = R\|R\|R + (R\|R\|R\|R\|R\|R) + (R\|R\|R)$

$= \frac{R}{3} + \frac{R}{6} + \frac{R}{3} = \frac{5}{6}R$

P1.51. $R_{eq} = R + R\|R_{eq} = R + \frac{1}{\frac{1}{R}+\frac{1}{R_{eq}}} = R + \frac{RR_{eq}}{R+R_{eq}}$

(a) so $R_{eq}(R+R_{eq}) = R(R+R_{eq}) + RR_{eq}$

$\frac{R_{eq}}{R} = 1.62, -0.618 \Rightarrow R_{eq} = 1.62R$

(b) $R_{eq} = R + R\|2R_{eq} \Rightarrow R_{eq}(R+2R_{eq}) = R(R+2R_{eq}) + 2RR_{eq}$

$R_{eq} = 1.78R, -0.281R$

P2.29 $\frac{v_a - v_b}{7} + \frac{v_a - 10}{15} = 2 \Rightarrow v_a\left(\frac{1}{7}+\frac{1}{15}\right) + v_b\left(-\frac{1}{7}\right) = 2$

(a) $\frac{v_b - v_a}{7} + \frac{v_b - 10}{10} = +2 \Rightarrow v_a\left(-\frac{1}{7}\right) + v_b\left(\frac{1}{7}+\frac{1}{10}\right) = +2$

$v_a = -6.56\,V, \; v_b = +4.38\,V$

(b) $v_{ar} = -6.56, \; v_{br} = +4.38 \qquad v_{ab} = v_{ar} + v_{rb}$

$= -6.56 - 4.38 = -10.9\,V$

$v_{ra} + v_{ab} + v_{br} = 0$

$-(-6.56) + (-10.9) + (4.38) = 0$

P2.29(c) $v_a' = 2v_{ar} = 2\times(-6.56) = -13.1\,V$

$v_{br}' = v_{br} = +4.38$

$v_{ab}' = v_{ar}' - v_{br}' = -13.1 - 4.38 = -17.5\,V$

$v_{ra}' + v_{ab}' + v_{br}' \overset{?}{=} 0 \quad -(-13.1) + (-17.5) + (4.38) = 0$ ✓

P2.31. $v_{ar} - 5 = 0 \Rightarrow v_{ar} = v_a = +5$

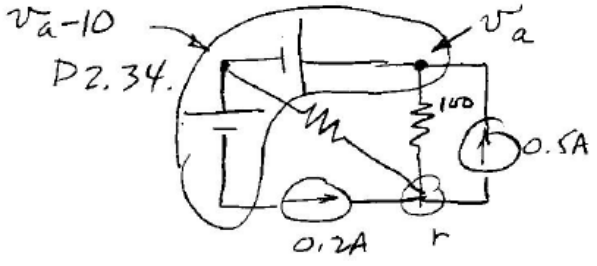
(a) $v_{cr} + 10 = 0 \Rightarrow v_{cr} = v_c = -10$

(b) $\dfrac{v_b - (+5)}{100} + \dfrac{v_b - 10}{50} + \dfrac{v_b - (-10)}{150} = +0.1$

$$v_b = \frac{0.1 + 0.05 - 10/150}{\frac{1}{100} + \frac{1}{50} + \frac{1}{150}} = 2.27 \Rightarrow i = \frac{2.27}{50}$$

$$= 4.55 \times 10^{-2}\,A$$

P2.34.



$\dfrac{v_a - (0)}{100} + \dfrac{v_a - 10 - (0)}{200} = +0.5 - 0.2$

$v_a = 23.3\,V$

$i = \dfrac{23.3}{100} = 0.233$