1.

a. $\Delta V = 9 - (3)(1) = 6V$

b. $12 = \frac{6^2}{R_2}$ $R_2 = 3\,\Omega$

c.

R_1 AND $R_2 = \frac{6}{3} = 2\,\Omega$

$\frac{1}{R_1} + \frac{1}{3} = \frac{1}{2}$ $R_1 = 6\,\Omega$

2.

a. $\frac{1}{4} + \frac{1}{4} + \frac{1}{2} = \frac{1}{R_{EQ}}$

$R_{EQ} = 1\,\Omega$

$\Sigma R = 8\,\Omega$

$I_{CIRCUIT} = \frac{48}{8} = 6A$

$\Delta V_{\text{PARALLEL RESISTORS}} = -6V$ $\quad I_{2\Omega} = 3A$

b. $P = -I^2 \cdot R = -(6^2)(3) = -108W$

c. $\Delta V = \mathcal{E} - I \cdot r$

$= -12 - (6)(1) = -18V$

BOTH NEGATIVE IF CURRENT FLOWS LEFT TO RIGHT

3.

a. $\frac{1}{R_{EQ}} = \frac{1}{12} + \frac{1}{6}$ $R_{EQ} = 4\ \Omega$

$-18 = -(2)(R+4)$

$R = 5\ \Omega$

b. $\Delta V_{\text{PARALLEL RESISTORS}} = -(2)(4) = -8V$

i. $I = 8/6 = 4/3\ A$

ii. $I = 8/12 = 2/3\ A$

c. $V_B = +10V$ $V_C = -10V$ $V_D = -2V$

d. $P = I \cdot \Delta V = (2)(20) = 40\ W$

4.

a. $\frac{1}{4} + \frac{1}{12} = \frac{1}{R}$ $R = 3\,\Omega$

$\Sigma R = 3 + 9 = 12\,\Omega$

b. $V = (I)(R) = (0.4)(12) = 4.8\,V$

c. $\Delta V_{R3} = -(0.4)(9) = -3.6\,V$ so $\Delta V_{R1} = -1.2\,V$

d.

$P = \frac{-\Delta V^2}{R} = \frac{-1.2^2}{4} = -0.36\,W$

e. $Q = I \cdot \Delta t = (0.4)(60) = 24\,C$

5.

a. $$\frac{1}{R_{EQ}} = \frac{1}{12} + \frac{1}{4+8}$$

$$R_{EQ} = 6\,\Omega$$

b. $$I = \frac{24V}{12\,\Omega} = 2A$$

c. $$\Delta V_T = \mathcal{E} - I \cdot r = 24 - (2)(1) = 22V$$

d. $$\frac{\Delta E}{\Delta t} = P = -I^2R = -(1^2)(12) = -12W$$

e. $$\Delta V = -I \cdot R = -(2)(6) = -12V$$

f. $$P = I \cdot \Delta V = (2A)(22V) = 44W$$

6.

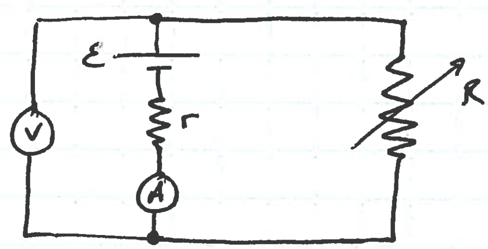
a. $\mathcal{E}$ IS ΔV WHEN $I = 0$, SO THIS IS THE Y-INTERCEPT OF THE GRAPH, 4.5 V.

b. $\Delta V = \mathcal{E} - I \cdot r$, SO r IS THE NEGATIVE OF THE GRAPH'S SLOPE. $r = 0.5\,\Omega$.

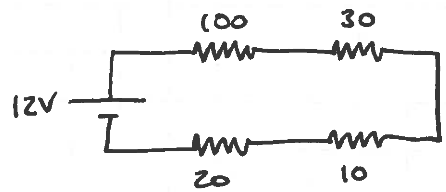
c. $\frac{4.5}{3} = R + 0.5$ SO $R = 1\,\Omega$

d. IF $R_{EXT} = 0$, $I = \frac{4.5}{0.5} = 9\,A$

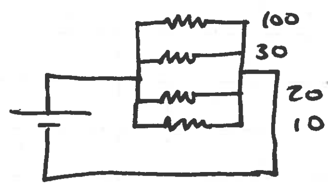
e.



7. a.



b.



c. i. $\frac{1}{R_{Eq}} = \frac{1}{100} + \frac{1}{20+30}$ $R_{Eq} = 33.\bar{3}\ \Omega$

$\Sigma R = 43.\bar{3}\ \Omega$

$I = \frac{12}{43.3} = 0.277A$

ii. $P = I \cdot \Delta V = (0.277)(12) = 3.323\ W$

d. $\Delta t = \frac{E}{P} = \frac{10,000}{3.323} = 3009\ s$

8.

a. $\frac{1}{R_{EQ}} = \frac{1}{6} + \frac{1}{3}$ $\quad R_{EQ} = 2\,\Omega$

$\Sigma R = 5\,\Omega$ $\quad I = \frac{9}{5} = 1.8\,A$

b. $P_A = -1.8^2 \cdot 3 = -9.72\,W$

$V_A = -5.4\,V$ so $V_B = V_C = -3.6\,V$

$P_B = -\frac{3.6^2}{6} = -2.16\,W$ $\quad P_C = \frac{-3.6^2}{3} = -4.32\,W$

BULB A IS BRIGHTEST.

c. BULB C DROPS TO ZERO BRIGHTNESS, AS THE CURRENT THROUGH IT DROPS TO ZERO.

BULB A DROPS IN BRIGHTNESS BECAUSE THE TOTAL RESISTANCE OF THE CIRCUIT INCREASES, DECREASING THE CURRENT THROUGH A.

BULB B INCREASES IN BRIGHTNESS. CURRENT THROUGH A DECREASES, SO ΔV_A ALSO DECREASES. ΔV_B MUST THEN INCREASE, SO ITS POWER DOES ALSO.

9.

a.

1 I_A

2 I_C

3 I_B

$I_A = I_C + I_B$ SO I_A IS GREATEST

$\Delta V_B = \Delta V_C$ AND R_C IS LESS THAN R_B

SO $I_C > I_B$

b.

1 A

2 B } EQUAL

3 C

$\Delta V = -I \cdot R$ AND A HAS THE HIGHEST CURRENT AND RESISTANCE

$\Delta V_B = \Delta V_C$ BECAUSE THEY ARE IN-PARALLEL

c.

$\frac{1}{R_{EQ}} = \frac{1}{400} + \frac{1}{200}$ $R_{EQ} = 133.\bar{3}\,\Omega$

$\Sigma R = 133.\bar{3} + 400 = 533.\bar{3}\,\Omega$

d.

$I_{LOOP} = \frac{12}{533.\bar{3}} = 0.0225\,A$

$\Delta V_A = -(0.0225)(400) = -9V$

SO $\Delta V_C = -3V$

$I_C = \frac{3}{200} = 0.015\,A$