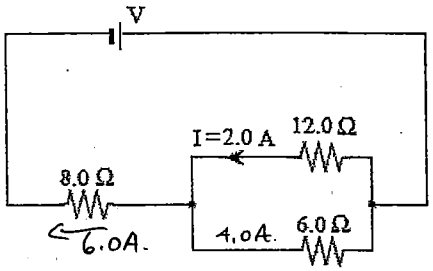
Key

# PHYSICS 11

## Electric Circuits 2

1. What is the voltage, V, of the power supply shown in the circuit?



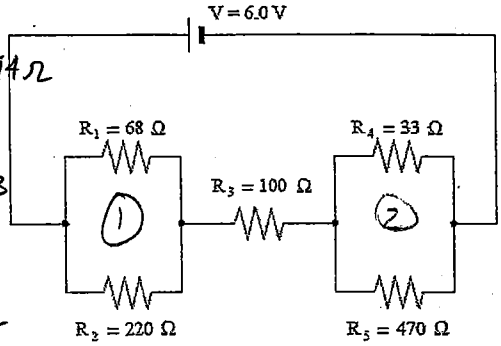

$I_0 = 6.0A$
$R_0 = 12\Omega$

① Squeeze $R_p \Rightarrow \frac{1}{6} + \frac{1}{12} = \frac{1}{R_p}$ / $R_p = 4.0\Omega$

② $R_0 = 8.0\Omega + 4.0\Omega = 12.0\Omega$

③ $V_0 = IR$ / $V_0 = (6.0)(12)$ / $V_0 = 72.0V$

2. What is the total resistance of the circuit?



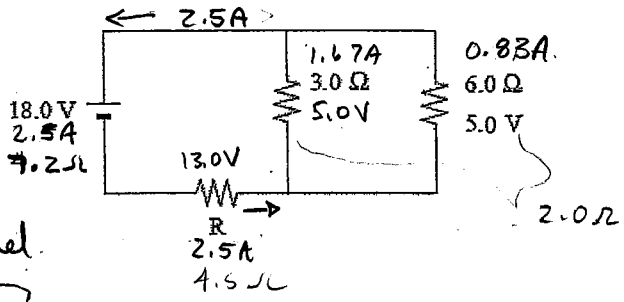

① $R_{p_1} \Rightarrow \frac{1}{R_{p_1}} = \frac{1}{68} + \frac{1}{220}$ / $\frac{1}{R_{p_1}} = \frac{288}{14960}$ / $R_{p_1} = 51.94\Omega$

② $\frac{1}{R_{p_2}} = \frac{1}{33} + \frac{1}{470}$ / $\frac{1}{R_p} = \frac{503}{15510}$ / $R_{p_2} = 30.83$

③ $R_0 = 51.94 + 100 + 30.83$ / $R_0 = 182.77\Omega$

$R_0 = 183\Omega$

3. In the following circuit, determine the value of resistor R.



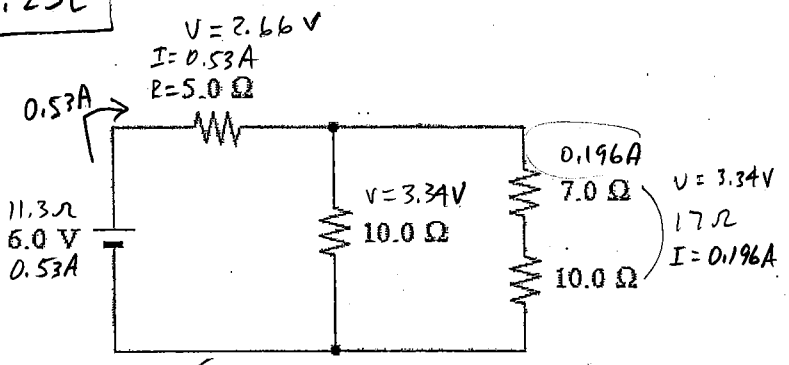

① Squeeze $R_p \Rightarrow \frac{1}{36} + \frac{1}{6} = \frac{1}{R_p}$ / $R_p = 2.0\Omega$

② Solve V of Resistor

③ Solve current in resistors in parallel

④ $V = IR$ / $18.0V = (2.5)(R_T)$ / $R_T = 7.2\Omega$

4. What is the current through the 7.0 Ω resistor? How much charge flows through the 7.0 Ω resistor in a 30 s interval?



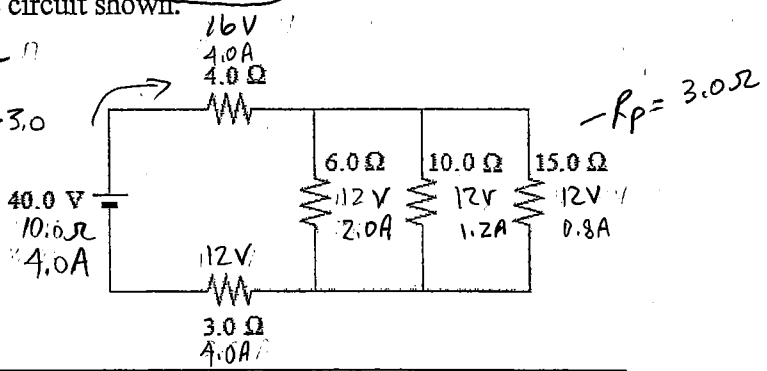

① Squeeze $\rightarrow \frac{1}{R_p} = \frac{1}{10} + \frac{1}{17}$ / $R_p = 6.296\Omega$

② $R_0 = 5.0 + 6.296$ / $R_0 = 11.296\Omega$

③ $V_0 = IR$ / $6.0 = (I)(11.3)$ / $0.5311A = I_0$

$I = 0.196A$ / $1Amp = \frac{C}{s}$ / $0.196 = \frac{Q}{30}$ / $5.89$ coulombs

5. Calculate the current through the 6.0 Ω resistor in the circuit shown.




① Squeeze $\frac{1}{R_p} = \frac{1}{6} + \frac{1}{10} + \frac{1}{15}$ / $R_p = 3.0\Omega$

② $R_0 = R_1 + R_2 + R_3$ etc. / $R_0 = 4.0 + 3.0 + 3.0$

$R_0 = 10\Omega$

③ $V_0 = IR$ / $40.0 = (I)(10)$ / $V_0 = 4.0A$

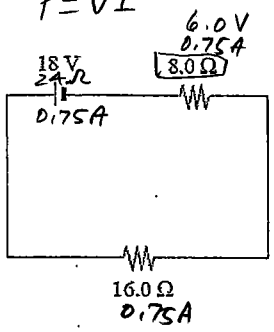
④ $V = IR$ / $12 = (I)(6.0)$ / $I = 2.0A$

$R_p = 3.0\Omega$

# Electric Circuits III: Power

$P = VI$

1. Calculate the power dissipated by the 8.0 Ω resistor in the circuit shown.

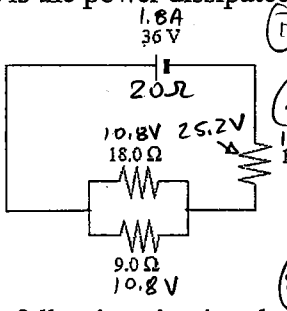



(1.) $R_S = 8 + 16$ / $R_S = 24\,\Omega$

(2.) $V = IR$ / $18 = I(24)$ / $I_0 = 0.75A$.

(3.) $P = (6.0)(0.75)$ / $P = 4.5\,W$

2. What is the power dissipated in the ~~9.0 Ω~~ resistor in the following circuit?




(1.) $\frac{1}{R_P} = \frac{1}{18} + \frac{1}{9}$ / $R_P = 6\,\Omega$

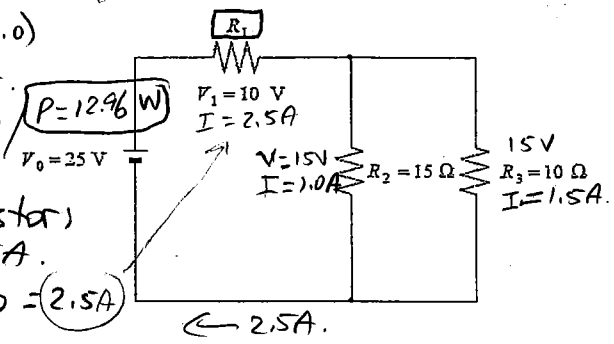
(2.) $R_0 = 14.0 + 6.0$ / $R_0 = 20\,\Omega$

(3.) $V_0 = IR$ / $36 = (I)(20)$ / $I = 1.8A$

(4.) $V = IR$ / $10.8 = (I)(9.0)$ / $I = 1.2A$.

(5.) $P = VI$ / $P = (10.8)(1.2)$ / $P = 12.96\,W$

3. In the following circuit, what is the power dissipated by resistor $R_1$?

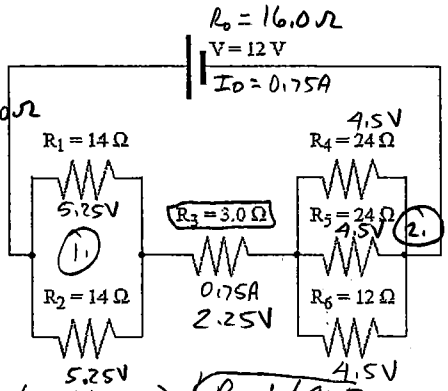



(1.) Solve current in both parallel resistors
$V = IR$ / $15/15 = 1.0A$ / $15/10 = 1.5A$.

(2.) $I_0$ = sum of parallel currents. $1.5 + 1.0 = 2.5A$

(3.) $P = VI$ / $P = (10)(2.5)$ / $P = 25\,W$

4. What is the power dissipated by the 3.0 Ω resistor in the circuit below?




(1.) $R_{P_1} = 7.0\,\Omega$ (2.) $R_{P_2} \Rightarrow \frac{1}{R_{P_2}} = \frac{1}{24} + \frac{1}{24} + \frac{1}{12}$ / $R_{P_2} = 6.0\,\Omega$

(3.) $R_S = 7.0 + 6.0 + 3.0$ / $R_S = 16.0\,\Omega$

(4.) $V_0 = IR$ / $12 = (I)(16)$ / $I_0 = 0.75A$

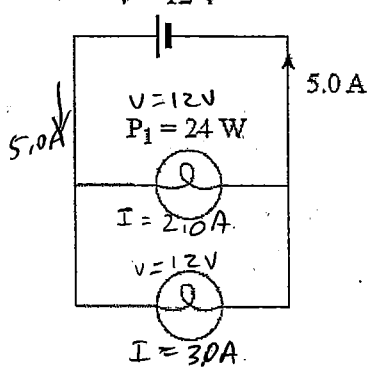
(5.) $V_1 = IR$ / $V_1 = (0.75)(7.0)$ / $V_1 = 5.25V$

(6.) $V_2 = IR$ / $V_2 = (0.75)(6.0)$ / $V_2 = 4.5V$

(7.) $V_3 = 12 - 4.5 - 5.25$ / $V_3 = 2.25V$

(8.) $P = VI$ / $P = (2.25)(0.75)$ / $P = 1.69W$

5. A 12 V battery supplies a 5.0 A current to two light bulbs as shown below. The power output of one of the bulbs is P1 = 24 W. What is the power output of the other bulb?




(1.) $P_1 = VI$ / $24 = (12)(I_1)$ / $I_1 = 2.0A$.

(2.) $P_2 = VI$ / $P_2 = (12)(3.0)$ / $P_2 = 36\,W$

6. A 660 W electric heater is designed to operate from a 120 V source. If the source voltage drops to 80.0 V, what will be the power dissipated by the same heater? (Assume the resistance of the heater is constant.)

$P = VI$ / $660 = (120)(I)$ / $I = 5.5A$. / $120 = 5.5(R)$ / $R = 21.82\,\Omega$

$V = IR$ / $80 = (I)(21.82)$ / $I = 3.67A$ / $P = VI$ / $P = (80)(3.67)$ / $P = 392\,W$

7. A 75 W bulb is connected across a 120 V source. While the bulb is lighted, what is the effective resistance of the bulb? $P = VI$ / $75 = (120)(I)$ / $I = 0.625A$

$V = IR$ $120 = (0.625)(R)$ / $R = 192\,\Omega$