E. Arrambide Physics AP/Dual

Name: Ivy Period: Date:

Electric Circuits problems 1

SERIES	PARALLEL
$V=V_1+V_2+V_3$	$V=V_1=V_2=V_3$
$I=I_1=I_2=I_3$	$I=I_1+I_2+I_3$
$R=R_1+R_2+R_3$	$\frac{1}{R_T}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$

I. Simplify the following electric circuits. Show your work to get full credit.

1.

a. Type of Circuit (Series/Parallel): Series

b. Total Resistance in the circuit: 24Ω

c. Current flowing in the circuit: 0.75A

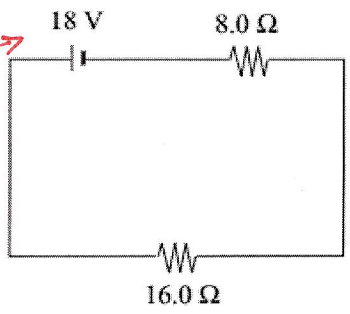
d. Voltage for the 8Ω resistor: 6V

e. Voltage for the 16 Ω resistor: 12V

6+12=18V

f. Power dissipated by the 8Ω resistor: 4.5W

g. Power dissipated by the 16Ω resistor: 9W



b) $R_T=R_1+R_2=8+16=24\Omega$

c) $I=\frac{V}{R}=\frac{18V}{24\Omega}=0.75A$

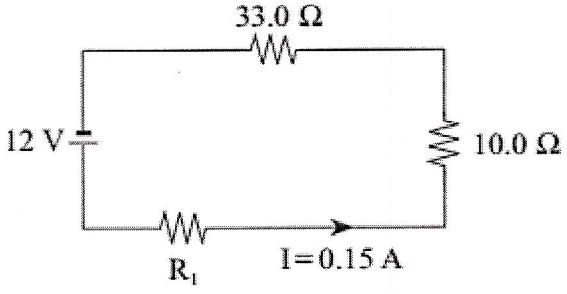
d) $V_1=IR_1=(.75)(8\Omega)=6V$

$V_2=IR_2=(.75)(16\Omega)=12V$

f) $P=I^2R=(.75)^2(8)=4.5W$

$P=I^2R=(.75)^2(16)=9W$

2. What is the power dissipated in resistor R1 in the circuit shown in the diagram below? P= 0.83W



STEP 1: Find total Resistance in circuit

$R=\frac{V}{I}=\frac{12V}{.15}=80\Omega$

In Series, the total resistance is added

$R_T=R_1+R_2+R_3$

$80=R_1+10+33$

$80=R_1+43$

$80-43=R_1$

$R_1=37\Omega$

STEP 2: Find Power

$P=I^2R=(.15)^2(37)$

$P=0.83W$

3.

a. Type of Circuit (Series/Parallel): Parallel

b. Total Resistance in the circuit: 2.22Ω

c. Current leaving the battery: 5.41A

d. Current flowing through the 5 Ω resistor: 2.4A

e. Current flowing through the 4 Ω resistor: 3A

2.4+3=5.4

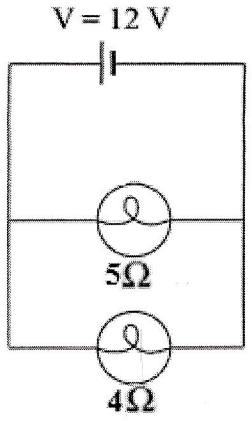
f. Voltage for the 5Ω resistor: 12V

g. Voltage for the 4 Ω resistor: 12V

Constant in Parallel

h. Power dissipated by the 5Ω resistor: 28.8W

i. Power dissipated by the 4Ω resistor: 36W



b) $\frac{1}{R_T} = \frac{1}{5} + \frac{1}{4}$

$\frac{1}{R_T} = \frac{4+5}{20}$

$\frac{1}{R_T} = \frac{9}{20}$

$R_T = 20/9 = 2.22\Omega$

c) $I = \frac{V}{R} = \frac{12}{2.22} = 5.41A$

d) $I_1 = \frac{V}{R_1} = \frac{12}{5} = 2.4A$

e) $I_2 = \frac{V}{R_2} = \frac{12}{4} = 3A$

h) $P_1 = I_1^2 R_1 = (2.4)^2(5) = 28.8W$

i) $P_2 = I_2^2 R_2 = (3)^2(4) = 36W$

4.

a. Type of Circuit (Series/Parallel): Parallel

b. Total Resistance in the circuit: 1.71Ω

c. Current leaving the battery: 2.92A

d. Current flowing through the 12 Ω resistor: 0.42A

e. Current flowing through the 6 Ω resistor: 0.83A

f. Current flowing through the 3 Ω resistor: 1.67A

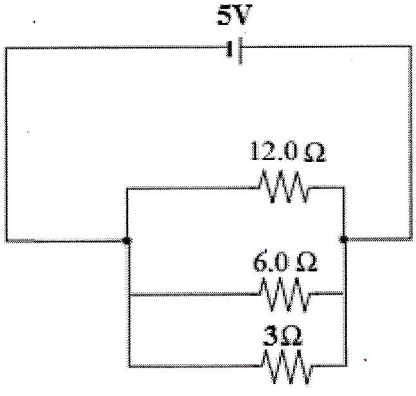
Sum same as

f. Voltage for the 12Ω resistor: 5V

g. Voltage for the 6 Ω resistor: 5V

h. Voltage for the 3 Ω resistor: 5V

Constant in Parallel



b) $\frac{1}{R_T} = \frac{1}{12} + \frac{1}{6} + \frac{1}{3}$

$\frac{1}{R_T} = \frac{1+2+4}{12}$

$\frac{1}{R_T} = \frac{7}{12}$

$R_T = \frac{12}{7} = 1.71\Omega$

c) $I = \frac{V}{R} = \frac{5V}{1.71} = 2.92A$

d) $I_1 = \frac{V}{R_1} = \frac{5V}{12} = 0.42A$

$I_2 = \frac{V}{R_2} = \frac{5}{6} = 0.83A$

$I_3 = \frac{V}{R_3} = \frac{5}{3} = 1.67A$