DC Circuits
Honors Physics 2008/09

Name Key

Series Circuit Problems: **Show your work – Draw the circuit – Make a chart**

1. Three resistors, 25. Ω, 45. Ω and 75. Ω are connected in series and a 0.51 A current passes through them. Determine:
   a) The equivalent resistance. *(145. Ω)*

$$R = R_1 + R_2 + R_3 = 25 + 45 + 75 = 145\ \Omega$$

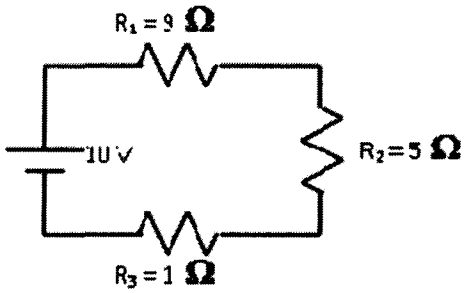
   b) The potential difference across all three resistors. *(74. V)*

$$V = IR = 0.51(145) = 74\ V$$

2. Three resistors, 9.0 Ω, 5.0 Ω and 1.0 Ω are connected in series across a 24 V battery. Find:
   a) The current in each resistor. (1.6 A)

   b) The voltage difference across each resistor. (14 V, 8.0 V, 1.6 V)

   c) The power dissipated by each resistor. (23 W, 13 W, 2.6 W)



	R	I	V	P
R_1	9	1.6	14	23
R_2	5	1.6	8	13
R_3	1	1.6	1.6	2.6
TOTAL	15	1.6		

3. A battery dissipated 2.5 W of power in each of two 47.0 Ω resistors connected in series. What is the voltage of the battery?

$$P = IV$$

$$I = \frac{V}{R}$$

$$P = \left(\frac{V}{R}\right)V = \frac{V^2}{R}$$

$$2(2.5) = \frac{V^2}{2(47)}$$

$$V^2 = 470$$

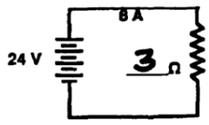
$$V = 21.7 \text{ volts}$$

DC Circuits
Honors Physics 2008/09

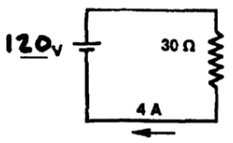
4. A 16.0 Ω resistor and an 8.0 Ω are connected in series across a 12 V battery. What is the voltage difference across each resistor? *(8.0 V, 4.0 V)*

	R	I	V	P
R_1	16	0.5	8	4
R_2	8.0	0.5	4	2
TOTAL	24	0.5	12.0	6

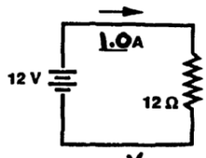
$V = IR$



$R = \frac{V}{I} = \frac{24}{8}$

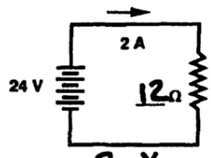


$V = IR$
$= 30(4)$



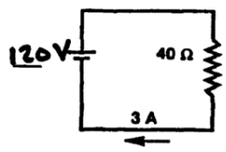
$I = \frac{V}{R}$

$I = \frac{12}{12}$

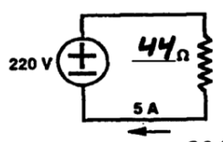


$R = \frac{V}{I}$

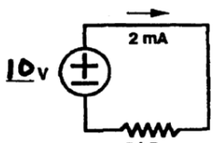
$R = \frac{24}{2}$



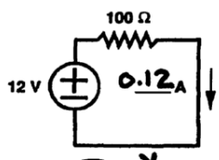
$V = IR$
$= 3(40)$



$R = \frac{V}{I} = \frac{220}{5}$

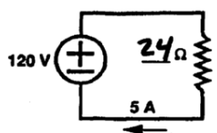


$V = IR$
$(.002)5000$



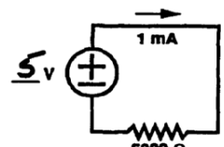
$I = \frac{V}{R}$

$I = \frac{12}{100}$

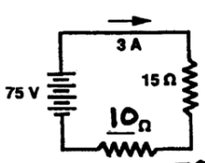


$R = \frac{V}{I}$

$= \frac{120}{5}$

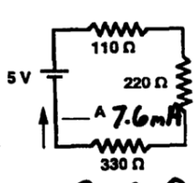


$V = IR$
$= .001(5000)$



$R = \frac{V}{I} = \frac{75}{3}$

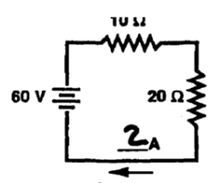
$R = 25$



$R = 660$

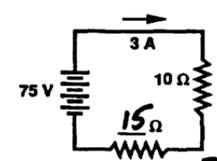
$I = \frac{V}{R} = \frac{5}{660}$

$I = 7.6\,mA$



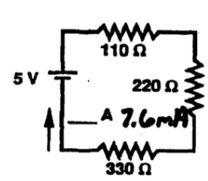
$R = 30$

$I = \frac{V}{R} = \frac{60}{30}$

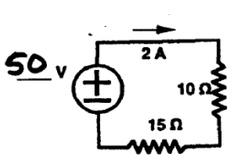


$R = \frac{V}{I} = \frac{75}{3}$

$R = 25$



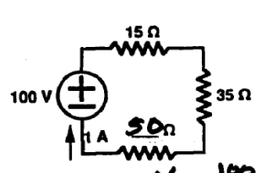
$R = 660$



$R = 25$

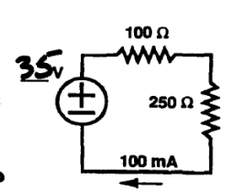
$V = IR$

$V = 2(25)$



$R = \frac{V}{I} = \frac{100}{1}$

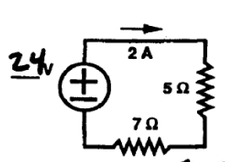
$R = 100$



$R = 350$

$V = IR$

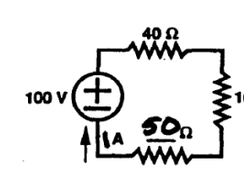
$V = 0.1(350)$



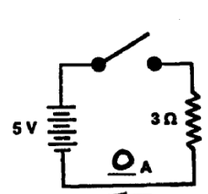
$R = 12$

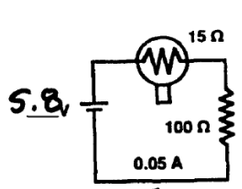
$V = IR$

$V = 2 \cdot 12$



$R = \frac{V}{I} = 100$



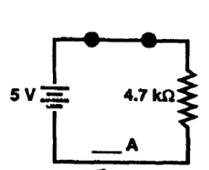


$R = 115\,\Omega$

$V = IR$

$0.05(115)$

$V = 5.75$

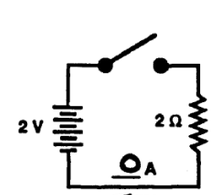


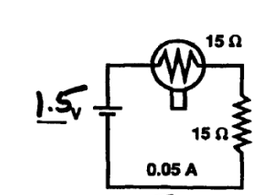
$I = \frac{V}{R}$

$= \frac{5}{4700}$

~~$= 0.106\,mA$~~

$1.06\,mA$





$R = 30$

$V = IR$

$= 0.05(3$

$V = 1.5$