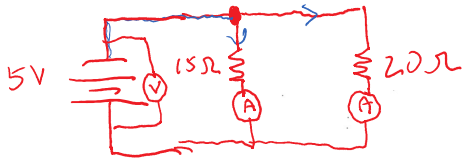
Name _____ Regents Physics
Parallel Circuit Electricity Unit

1. A 15 ohm and a 20 ohm resistor are connected in parallel to a battery that provides a potential difference of 5 V.

A) Draw a circuit diagram. Include ammeters to measure the current through each resistor and a voltmeter to measure the total potential difference.



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

	V	I	R	P
1	5V	.333A	15Ω	
2	5V	.25A	20Ω	
T	5V	0.583A	8.57Ω	

B) The current, potential difference, or resistance is the same through each resistor. (circle one)

C) Calculate the equivalent resistance.

$\left(\frac{1}{R_{EQ}}\right)^{-1} = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1} \rightarrow R_{EQ} = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1}$

$R_{EQ} = \left(\frac{1}{15\Omega} + \frac{1}{20\Omega}\right)^{-1} = 8.57\Omega$

D) Calculate the total current in the circuit.

$R = \frac{V}{I} \rightarrow I_T = \frac{V_T}{R_T} = \frac{5V}{8.57\Omega} = 0.583A$

E) Calculate the current through each resistor.

$I_1 = \frac{V_1}{R_1} = \frac{5V}{15\Omega} = 0.333A$ $\quad I_2 = \frac{V_2}{R_2} = \frac{5V}{20\Omega} = 0.25A$

F) What does the sum of these currents add up to? (Does this make sense)

$I_1 + I_2 = 0.333A + 0.25A = 0.583A$

↳ YES, ADDS UP TO TOTAL

G) Calculate the total amount of power used by the circuit

$P = I_T V_T = (0.583A)(5V) = 2.92W$

H) Calculate the amount of energy used by circuit if it was one for 120 s.

$W = Pt = (2.92W)(120s) = 350J$

2. A parallel circuit is made of two resistors and has a total resistance of 5 ohms. If the resistance for one resistor is 20 ohms, calculate the resistance for the second.

$R_1 = 20\Omega$
$R_T = 5\Omega$
$R_2 = ?$

$\frac{1}{R_{EQ}} = \frac{1}{R_1} + \frac{1}{R_2} \Rightarrow \left(\frac{1}{R_2}\right)^{-1} = \left(\frac{1}{R_{EQ}} - \frac{1}{R_1}\right)^{-1}$

$R_2 = \left(\frac{1}{R_{EQ}} - \frac{1}{R_1}\right)^{-1}$

$R_2 = \left(\frac{1}{5\Omega} - \frac{1}{20\Omega}\right)^{-1}$

$R_2 = 6.67\Omega$