Physics Quiz #3 Name_____

For the circuit illustrated to the right, write out a set of equations that would allow you to solve this circuit using Kirchoff's Rules. Using these equations find the voltage, V, of the power supply and the current, I_V, leaving the power supply if the value of I_1 is 4 amps? (Correct equations from Kirchoff's Rules accounts for 6 out of 10 points for this quiz.)
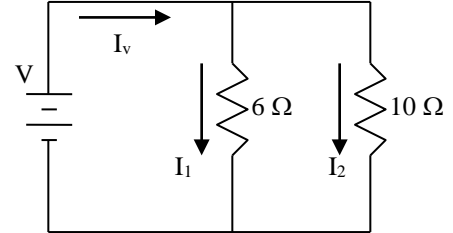
From Kirchoff's 1st rule of current you get the node equation: $\quad I_V = I_1 + I_2$

From Kirchoff's 2nd rule of voltage you get the loop equations: $\quad V - I_1 R_1 = 0$

$$I_1 R_1 - I_2 R_2 = 0$$

Substituting in the resistor values the equations become

$$I_V = I_1 + I_2$$
$$V - 6 I_1 = 0$$
$$6 I_1 - 10 I_2 = 0$$

Since we know that $I_1 = 4$, using the last equation gives

$$I_2 = \frac{6 I_1}{10} = \frac{3}{5} I_1$$

$$I_2 = \frac{3}{5}(4) = 2.4$$

From the second equation we get the voltage of the power supply.

$$V = 6 I_1 = 6(4) = 24$$

Finally using the first equation and the values for I_1 and I_2 gives a power supply current of

$$I_V = I_1 + I_2 = 4 + 2.4 = 6.4$$

Since resistance was given in ohms and current in amps, the voltage is in volts.

Therefore the voltage and the current of the power supply is

$$V = 24 \ V$$
$$I_V = 6.4 \ A$$