## Answer on Question#79900 – Physics – Electric Circuits

What is the net resistance of a parallel circuit? Solution.

Consider an electrical circuit with two resistors connected in parallel. Find the total resistance of the resistors



Both resistors between points A and B and have the same potential difference. Hence, voltage  $U_{AB} = U_1 = U_2$ . The sum of the currents  $I_1 + I_2$  flowing through both conductors is equal to the current in an unbranched circuit.  $I_A = I_1 + I_2 = I_B$ . Let R is total resistance of the resistors. Using Ohm's law we get

$$I_A = \frac{U_{AB}}{R}$$
.

Using the Ohm's law for each resistor separately we get

$$I_1 = \frac{U_1}{R_1} \text{ and } I_2 = \frac{U_2}{R_2}.$$
  
From the formula  $I_A = I_1 + I_2$  substituting  $I_A = \frac{U_{AB}}{R}$ ,  $I_1 = \frac{U_1}{R_1}$ ,  $I_2 = \frac{U_2}{R_2}$  get
$$\frac{U_{AB}}{R} = \frac{U_1}{R_1} + \frac{U_2}{R_2}.$$
We divide the equation by  $II_{AB}$ 

We divide the equation by  $U_{AB}$ 

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

We obtained a resistance formula for two resistors connected in parallel. In the same way, we can obtain a formula for net resistance of a parallel circuit (for n elements)

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$$
  
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