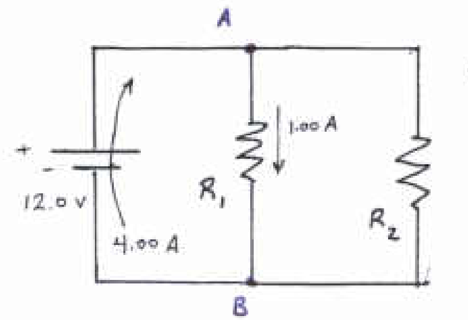
Name____________________________

Phys 122 — Section 1
Quiz #2



1. In the simple circuit shown here, resistors R_1 and R_2 are connected in parallel across a battery of voltage 12.0 V. The *total* current (i.e. through the battery) is 4.00 A. The current through R_1 is 1.00 A.

a) What is potential drop across R_1?

Same as the battery voltage: $\boxed{12.0\text{ V}}$

b) What is potential drop across R_2?

$V_{AB} = 12.0\text{ V}$

" " : $\boxed{12.0\text{ V}}$

c) What is the current I_2 through R_2?

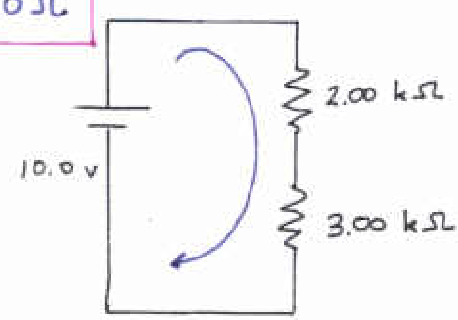
At junction A 4.00 A goes in and 1.00 A goes out along one branch. So $\boxed{3.00\text{ A}}$ must go out along the other branch

d) What is the value of R_1?

Ohm's Law for R_1 gives $R_1 = V_1/I_1 = \dfrac{12.0\text{ V}}{1.00\text{ A}} = \boxed{12.0\,\Omega}$

e) What is the value of R_2?

Ohm's Law for R_2 gives $R_2 = V_2/I_2 = \dfrac{12.0\text{ V}}{3.00\text{ A}} = \boxed{4.0\,\Omega}$



2. A $2.00\,\text{k}\Omega$ and a $3.00\,\text{k}\Omega$ resistor are connected in series across a 10.0 V battery.

a) Find the current in this circuit.

The equivalent resistance is $R_{eq} = 2.00\,\text{k}\Omega + 3.00\,\text{k}\Omega$
$= 5.00\times10^{3}\,\Omega$

So the (total) current is

$$I = \frac{V}{R_{eq}} = \frac{10.0\text{ V}}{5.00\times10^{3}\,\Omega} = \boxed{2.00\times10^{-3}\text{ A}} = 2.00\text{ mA}$$

(Same current as in either resistor.)

b) How much charge flows past any point in the circuit in 10.0 seconds?

Since the current at any point in the circuit is 2.00×10^{-3} A, the charge which passes in 10.0 s is

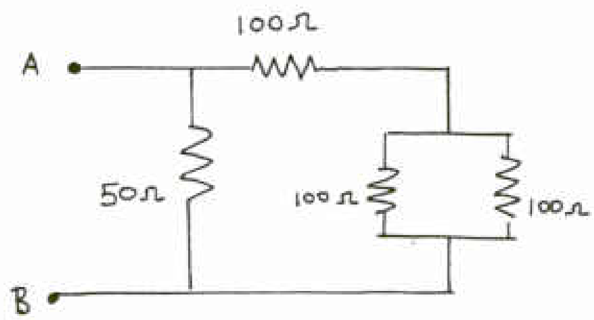
$$q = It = (2.00\times10^{-3}\text{ A})(10.0\text{ s}) = \boxed{2.00\times10^{-2}\text{ C}}$$

c) What is the power dissipated in the $2.00\,\mathrm{k}\Omega$ resistor?

Power dissipated in this resistor is

$$P = I^2 R = (2.00\times10^{-3}\,\mathrm{A})^2(2.00\times10^{3}\,\Omega) = \boxed{8.00\times10^{-3}\,\mathrm{W}}$$

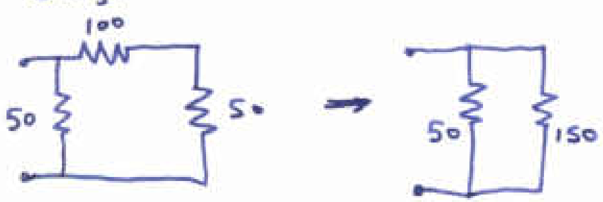
3. Find the equivalent resistance (from point A to point B) for the combination of resistors shown at the right.



Two parallel 100Ω resistors are equivalent to

$$\frac{1}{R_{par}} = \frac{1}{100\,\Omega} + \frac{1}{100\,\Omega} \Rightarrow R_{eq} = 50\,\Omega$$

Giving:



which finally reduces to

$$\frac{1}{R_{eq}} = \frac{1}{50\,\Omega} + \frac{1}{150\,\Omega}$$

$$\boxed{R_{eq} = 37.5\,\Omega}$$

You must show all your work!

$$I = \frac{q}{t} \qquad V = IR \qquad R = \rho\frac{\ell}{A} \qquad P = VI = I^2R = \frac{V^2}{R} \qquad q = CV \qquad \text{Energy} = Pt$$

$$R_{ser} = R_1 + R_2 + \cdots \qquad \frac{1}{R_{par}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots \qquad \frac{1}{C_{par}} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots \qquad C_{par} = C_1 + C_2 + \cdots$$

Circle: $C = 2\pi R \quad A = \pi R^2$ Sphere: $A = 4\pi R^2 \quad V = \frac{4}{3}\pi R^3$

$$V_{rms} = \frac{V_0}{\sqrt{2}} \qquad I_{rms} = \frac{I_0}{\sqrt{2}}$$

Some EM units: Coulomb, Volt, Farad, Ampere, Watt, Ohm

Sum of currents going into junction equals sum of currents coming out of junction; around ant closed loop, the sum of potential gains equals the sum of potential drops.