23. Current is defined as I = the amount of charge passing a point each second. If the charge passing a point is 1 Coulomb each second, the

current is defined as 1 Ampere (A). Therefore a current of 0.5 A must represent a charge flow of 0.5 C per second. Also, since the charge of a single electron has a magnitude of 1.6×10^{-19} C, 0.50 C must be

$$(0.5 \text{ C})/(1.6 \times 10^{-19} \text{ C per electron}) = 3.1 \times 10^{18} \text{ electrons.}$$

25. As stated in the last problem, the current = (the charge passed)/(time). Thus,

$$I = (1 \times 10^{-9} \text{ C})/(1 \times 10^{-7} \text{ s}) = 0.01 \text{ A.}$$

26. A resistor is a circuit element that limits how much current passes through when a voltage difference is applied across it. Ohm's law defines resistance through the relation $V = IR$, where the proportionality constant R is called the resistance. If 1 A flows when a voltage drop of 1 V is applied to a resistor the element is said to have a resistance of 1 ohm. "Ohms" is expressed by the Greek Letter "capital omega," but since some browsers do not support Greek letters I will always write out the word ohms. In this problem, a current of 3 A flows through a 12-ohm resistor. Thus,

$$V = IR = (3 \text{ A})(12 \text{ ohms}) = 36 \text{ V.}$$

30. Notice that the rules by which resistors in combination are evaluated to obtain equivalent resistance is opposite in form when compared with capacitors. Assume the three resistors 5, 7 and 9 ohms.

    a. In series, total resistance is the sum of the three individual resistances.

    $R_{\text{eff}} = 5 \text{ ohms} + 7 \text{ ohms} + 9 \text{ ohms} = 21 \text{ ohms.}$

    b. In parallel the effective resistance is found from $1/R_{\text{eff}} = (1/5 + 1/7 + 1/9) \text{ ohms}^{-1}$. Evaluating this sum by using the common denominator method gives

    $1/R_{\text{eff}} = 143/315 \text{ ohms}^{-1}$ or $R_{\text{eff}} = 2.2 \text{ ohms.}$

35. The 5-ohm and 4-ohm resistors are in parallel. These two should be combined first to get an "first step" value of resistance. I will call it R'

    $1/R' = (1/5 + 1/4) \text{ ohms}^{-1}$ or $R' = (20/9) \text{ ohms} = 2.2 \text{ ohms.}$

    Then this equivalent resistance of the parallel pair is in series with the 3-ohm resistor. Therefore,

    $R_{\text{eff}} = R' + 3 \text{ ohms} = (2.2 + 3.0) \text{ ohms} = 5.2 \text{ ohms.}$