Ohm's Law PS

1. $I = 1.00\,mA = 1\times10^{-3}\,A = .001\,A$
   $t = 60.0\,s$

   a) $I = \frac{q}{t}$ $\quad \left(.001 = \frac{q}{60}\right)60$ $\quad \boxed{q = 0.06\,C}$

   b) $0.06\,C \quad 1e = 1.6\times10^{-19}\,C$

   $$0.06\,C\left(\frac{1\text{ electron}}{1.6\times10^{-19}\,C}\right) = \boxed{3.75\times10^{17}\text{ electrons}}$$

   c) $\boxed{0 \text{ protons}}$ (they don't move)

2. $R = 1\times10^{4}\,\Omega = 10{,}000$
   $I = 30.0\,mA = 30\times10^{-3}\,A = 0.0300\,A$
   $V = ?$

   $V = IR$
   $V = (10{,}000)(.3) = 300.\ V = \boxed{3.00\times10^{2}\,V}$

   to show 3 sig figs we need to use scientific notation

3. $R = 1.25\,k\Omega = 1.25\times10^{3}\,\Omega = 1250\,\Omega$
   $I = 1.03\,mA = 1.03\times10^{-3}\,A = 0.00103\,A$
   $V = ?$ (potential difference is voltage)

   $V = IR$
   $V = (0.00103)(1250) = \boxed{1.29\,V}$

4. The configuration with 1 10Ω resistor, because it has less total resistance than the 3 5Ω resistors (which have a total resistance of 15Ω). **B**

5. $\frac{1}{6.7}+\frac{1}{6.7}+\frac{1}{6.7}+\frac{1}{6.7}=\frac{1}{R}$

$\frac{4}{6.7}=\frac{1}{R}$

$R=\frac{6.7}{4}=$ **$1.68\,\Omega$**

6. $q=1.38\times10^{-6}C$
$t=5.72s$
$I=?$

$I=\frac{q}{t}$

$I=\frac{1.38\times10^{-6}}{5.72}=$ **$2.41\times10^{-7}A$**

7. $R=205\,\Omega$
$V=120V$
$I=?$

$V=IR$

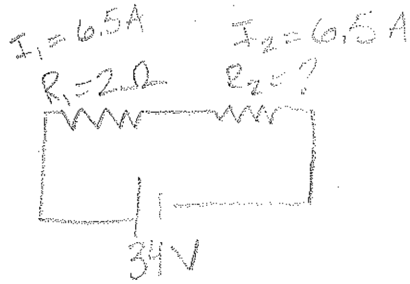
$\frac{120=I(205)}{205}$

$I=0.585A$

8. **The Same**, because the current along one path is constant. The battery is on one path, so the current would be the same.

9. **Parallell** because when one goes out, the rest stay on.

10.



we need ΔV_2, to find R_2

$\Delta V_1 + \Delta V_2 = 34V$

$\Delta V_1 = I_1 \cdot R_1$

$\Delta V_1 = (6.5)(2) = 13V$

$\Delta V_2 = 34 - 13 = 21V$

$\Delta V_2 = I_2 \cdot R_2$

$\frac{21 = 6.5 R_2}{6.5}$

$\boxed{R_2 = 3.23\ \Omega}$

11. $\Delta V = 9.2\ \Omega$
$I = 4.6 A$
$R = ?$

a) $\Delta V = IR$

$\frac{9.2 = 4.6 R}{4.6}$

$\boxed{R = 2\ \Omega}$

b) parallell: $\frac{1}{2} + \frac{1}{2} = \frac{1}{R}$

$\frac{2}{2} = \frac{1}{R}$

$\boxed{R = 1\Omega}$

12. $\frac{1}{25} + \frac{1}{25} + \frac{1}{25} + \frac{1}{25} = \frac{1}{R_1}$

$\frac{4}{25} = \frac{1}{R_1}$ $R_1 = 25/4 = 6.25\ \Omega$

$\frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{1}{R_2}$

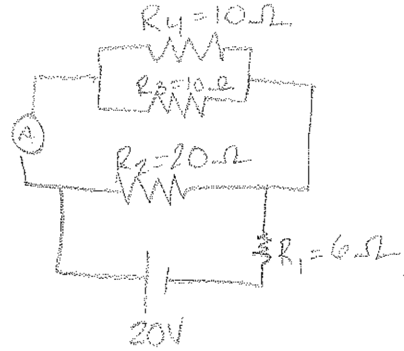
$\frac{4}{10} = \frac{1}{R_2}$

$R_2 = 10/4 = 2.5\ \Omega$

$R = 6.25 + 2.5$

$\boxed{R = 8.75\ \Omega}$

13.



Step 3: Find current thru ammeter.

$I = I_T - I_2$

$I = 2 - .4 =$ **1.6 A**

Step 1: Find total current

1a) find total resistance

$$\frac{1}{10} + \frac{1}{10} + \frac{1}{20} = \frac{1}{R_{234}}$$

$$\frac{5}{20} = \frac{1}{R_{234}}$$

$$R_{234} = 20/5 = 4\Omega$$

$R_T = R_{234} + R_1 = 4\Omega + 6\Omega$

$R_T = 10\Omega$

1b) use Ohm's law to find total current

$V = IR$

$\frac{20 = I(10)}{10}$ $\quad I_T = 2\text{ A}$

Step 2: Use Kirchoff's Law ($\Delta V = 0$ on a closed loop) to find current through R_2.

The current we want will be $I_T - I_2$

- On the path w/ R_2 there are two resistors $R_1 + R_2$, they will each take some voltage.
- R_1 has the full current flowing through it, so we can find its ΔV.

$$\Delta V_1 = I_1 R_1 = 2(6) = 12\text{ V}$$

- $\Delta V = 0 \therefore 20 - 12 - V_2 = 0$ ← finding ΔV of Resistor 2.

$$V_2 = 8\text{V}$$

- Now we can find I_2 $\quad V_2 = I_2 R_2 \quad 8 = I(20)$

$$I_2 = 8/20 = .4\text{ A}$$