Breakout Exercise #1

What is the voltage between two points if 1.2 J (joules) of energy are required to move 0.4 mC (coulombs) between the two points?

$$V = \frac{W}{Q} = \frac{1.2\,\mathrm{J}}{0.4\,\mathrm{mC}} = 3000\,\mathrm{V} = 3\,\mathrm{kV}$$

NO PRINT

Breakout Exercise #2

Find the charge Q that requires 96 J of energy to be moved through a potential difference of 16 V.

$$Q = \frac{W}{V} = \frac{96\ \text{J}}{16\ \text{V}} = 6\ \text{C}$$

NO PRINT

Breakout Exercise #3

Find the current in amperes if 12 mC of charge pass through a wire in 2.8 seconds.

$$I = \frac{Q}{t} = \frac{12\,\text{mC}}{2.8\,\text{sec}} = 0.004285\ \text{A} = 4.29\,\text{mA}$$

NO PRINT

Breakout Exercise #4

If a current of 40 mA exists for 0.8 minutes, how many coulombs of charge have passed through the wire?

$$Q = I \times t = 40\,\text{mA} \times 0.8\,\text{min} \times \frac{60\,\text{sec}}{1\,\text{min}} = 1.92\,\text{C}$$

NO PRINT

Breakout Exercise #5

Which would you prefer?

a) A penny for every electron that passes through a wire in 0.01 μSec at a current of 2 mA, OR

$$Q = I \times t = 2\,\text{mA} \times 0.01\ \mu\text{Sec} = 20\,\text{pC}$$

$$1\text{C} = 6.242 \times 10^{18}\ \text{electrons}$$

$$\therefore 20\,\text{pC} = 20 \times 10^{-12} \times 6.242 \times 10^{18} = 124.84 \times 10^{6}\ \text{electrons}$$

$$\therefore 1\ \text{penny / electron} = 124.84 \times 10^{6} \times \$0.01 = \$1{,}248{,}400$$

b) A dollar for every electron that passes through a wire in 1.5 nSec if the current is 100 μA.

$$Q = I \times t = 100\mu\text{A} \times 1.5\,\text{nSec} = 150\ \text{fC}\ (\text{femto} = 10^{-15})$$

$$1\text{C} = 6.242 \times 10^{18}\ \text{electrons}$$

$$\therefore 150\ \text{fC} = 150 \times 10^{-15} \times 6.242 \times 10^{18} = 936.3 \times 10^{3}\ \text{electrons}$$

$$\therefore 1\ \text{dollar / electron} = 936.3 \times 10^{3} \times \$1 = \$936{,}300$$

NO PRINT