

Electric Current = = ()

U7P2a

- Voltage is _____ per _____. So, when we examine electricity keeping track of the amount of _____ is important.
- As a result, _____ current is NOT the _____ of charges. Instead it is the _____ of _____ per _____.
- This means there are two ways to get a largish current.
 1. A _____ stream going _____.
 2. A _____ stream going _____.

Note: Of course, combining _____ stream with _____ speed gives a _____ current, a.k.a. _____.
- There is a really dumb thing to know about current in _____ circuits. Scientists defined _____ before atomic structure was understood. They had figured out there were _____ types of charge, but there was _____ way to know which charge types actually moved. They guessed that _____ charges do the moving!!
- As a result, “conventional current” in circuit diagrams goes the direction _____ charges _____ to move, which is _____ the direction _____ move.

Physically, _____ are going _____, but it looks like _____.

Drift Current

- Current does not measure _____ of charges. _____ does measure _____.

Q=total charge
q=single charge
n=density of single charges
A=area
V=volume
v=drift speed
t=time
#=number of single charges



- Note: when you flip a light switch, the light reacts at the speed of _____, not _____ speed. This is because a wire is like a hose _____, not an empty hose.

Resistance

U7P2b

- _____ is the tendency to _____ something from happening.
- In a stream of water, some things that would cause _____ to water _____ are
 - _____ - block the free flow of water within the stream channel
 - _____ / _____ - constrict where water may flow
- In a stream of “ _____ ”, resistance is controlled by
 - _____ - property of how freely charge flows within the _____.
 - _____ - constricts where _____ may flow.
 - _____ - increases the total number of obstacles for charges to navigate.
 - _____ - disrupts the orderly flow of charge
- All together resistance for a temperature independent resistor is $R =$ _____

Ohm's Law

- In terms of force, $V =$ _____. So, voltage is _____ to force on charges.
- Since force is what makes charges _____, $F \propto$ _____. So, $I \propto$ _____.
- Resistance tends to _____ current. So, $I \propto$ _____.
- Altogether, $I =$ _____, which is typically written _____ (_____ Law).
 - Note: Many materials obey Ohm's Law for normal temperature ranges, BUT all materials fail Ohm's Law if they get too _____ (or _____) and materials (like _____ in computer chips) _____ obey Ohm's Law.

Electric Power

- Power is _____ per _____. Current is _____ per _____. Voltage is _____ per _____.
- So, Power = $P =$ _____ = (_____) = (_____) = _____. (power generated by a _____)
- Using Ohm's Law, power also equals $P =$ _____ = _____ (power dissipated by a _____)
 $P =$ _____ = _____ into _____

Simple Circuit (log flume model)

- Positive voltage give _____ to positive charges, resistors convert that energy to _____.
So, _____ are places where “charge logs” are _____ and _____ are the _____.

Circuit Components

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() - stores large amounts of _____ for slow release and give constant _____ and DC current

() - stores _____ amounts of energy for _____ release (like in a camera _____)

() - supplies sinusoidal voltage and _____ current for as long as fuel lasts.

() - converts electrical energy into _____ energy (and _____)

() - slows _____ and converts electrical energy into _____ in the process

() - sets voltage to _____ and removes excess _____ from a circuit.

() - _____ / _____ current or changes current _____.

() - converts _____ energy into _____ energy (and _____)

() - measures the _____ in _____ between two points (must hook up in _____)

() - measures the _____ at _____ point (must hook up in _____)

() - measures the _____ between _____ points (must hook up in _____ with NO _____)

Resistors in Series (NOTE: the derived rules for resistors are the _____ of capacitor rules.)

- Since there is _____ pipe for the _____ to flow through $I_{\text{bat}} =$ _____.
- Since each _____ passes through _____ resistor going from _____ potential to _____ potential $V_{\text{bat}} =$ _____.
- Combine with _____.

Resistors in Parallel

- Since there _____ for positive charge to flow through $I_{\text{bat}} =$ _____.
- Since Each positive charge passes through _____ going from high to low potential. $V_{\text{bat}} =$ _____.
- Combine with _____.

Shorts and Breaks

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- Unlike water in a pipe, charges _____ flow out the end of a _____. So, where a wire ends, there will be _____ current. This is called a _____ (a.k.a. _____)
- Bare _____ act like water pipes with _____ cross-sectional area, assuming the wire is an excellent conductor (like _____, _____, etc.). So, if there are two paths for current to flow (_____ circuit), _____ current will take the path with a resistor and _____ current will flow through the bare wire. This is called a _____ (a.k.a. _____ to avoid resistors.)

Kirchoff's Laws (when you can't find R_{eff} the easy way)

- Junction Rule – the _____ flowing into an intersection _____ the current _____ the intersection. This is simply Conservation of _____.
- Loop Rule – The _____ gain must _____ the voltage drop going around a path back to the starting point. This is simply Conservation of _____.

RC Circuits (_____ and _____ circuits)

- RC circuits have a _____ and _____ in series. As the capacitor charges from a _____, it gets _____ to add more charge. So current “through” the circuit _____ with _____.
- At first, the capacitor is _____ charged, ergo _____ voltage and _____ resistance (behaves like a _____). Eventually, the capacitor is _____ charged, ergo _____ voltage and _____ resistance. (behaves like a _____).

Initial

Final

