Lesson 0: Voltage

Recall: Like charges _____
Unlike charges _____

You have probably heard of "volts" or "voltage". Voltage is a defined unit. It is defined as the amount of _____per _____of charge at a location.

Since energy is measured in _____and charge is measured in _____the units for voltage are:

Voltage =   _____

Voltage is a _____. It has a symbol capital _____ and the abbreviation for the unit "volts" is also a capital _____.

Have I mentioned lately that we are running out of letters?

Before spring break, we brought out the Van de Graaff generator and some students chose to receive an electric shock. I mentioned that the sparks being generated were several hundred thousand volts.

How was this possible? The voltage that comes out of a standard plug outlet is 120 V (in North America), and that is enough to cause serious injury.

The answer is in the definition of voltage. When students were getting shocked by the Van De Graaff generator, each _____of charge had _____ of energy but there the _____ of charge in coulombs was very small.

Compare that with a plug outlet. Although each coulomb of charge has only _____ J of energy, there is basically an _____supply of charge.

Key idea: _____measures the amount of _____per _____of charge at a location.

I find it helpful to have a "real world" analogy for voltage.
Consider gravitational potential energy:

PE = _____

If I pick a mass up from the floor and slowly begin lift it higher and higher, I am
_____the total potential energy.
Another way to think about this: I am increasing the _____
_____per _____.

When I have charges at a higher voltage, that increases the energy per
_____.

Voltage is sort of like _____. _____at a higher
voltage have more energy per coulomb kind of like _____at a higher
height have more energy per kilogram.

We will use "height" as an analogy for voltage when we begin to solve circuits next
lesson.

Because of this, another word that is often used in place of voltage is
"_____".

Don't confuse potential (in volts) with potential energy (in joules).

Summary:

Voltage is defined as the amount of energy per charge at a location.

Symbol: _____   Scalar or Vector?   Units: _____

Voltage is sort of like _____. Higher height means more energy per
_____. Higher voltage potential means more energy per
_____.

Another word for "voltage" is "_____".

Homework:

Do a google search for "phet html5 dc circuit construction kit" or go to the following link:

https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc

Click on the link, and then run the sim by pressing the play button:

If you have a mobile device, it should still work. I hope.

Once you are in, choose "Intro".
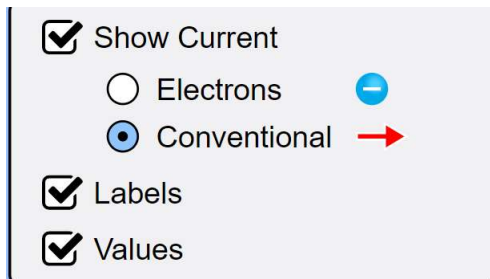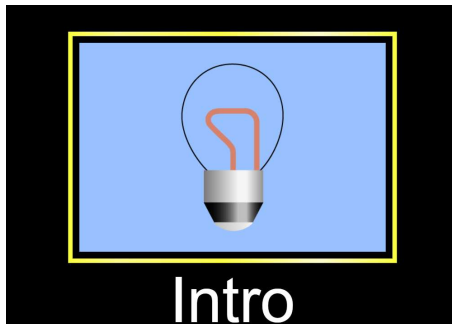
Toggle "Conventional" and toggle "Values".

Your homework is to build a circuit with 1 battery, 1 switch, and 2 lightbulbs that are lit up. Once you have built the circuit, take a picture of it on your phone (or take a screenshot) and email it to me. In your email, answer the following questions:

1. Use the voltmeter to measure the voltage in each light bulb. What is the voltage in each lightbulb? (ans: 4.5 V)

2. Use the ammeter to measure the current in the wire. What is the current in the wire? (ans: 0.45 A)

Note: the answers that I gave for the homework assume you are using the default values of the sim.