Charge and Fields

1120 Lab 1R

Last Edited May 17, 2024

Written by Dana

I Lab Objectives

- Identify the effects of electric fields on charged objects.
- Map electric field lines and equipotential surfaces.

Deliverable Summary

1. **Introduction**

   Please write an introduction section based on the theory that you are working with today. For reference on what it should look like please consult the Generic Deliverables at this link.

2. Drag a +1 nC charge to the center of the simulation window. In 1-2 sentences each answer the following questions:[1]

   (a) What is the direction of electric field – away from or toward the charge?

   (b) What do you think the relative brightness of the arrows show in this simulation?

   Remove the +1 nC charge by dragging back into the box where it was located initially, and then drag a -1 nC charge to the center of the simulation window.

   (c) Describe what you see in the simulation window now.

   (d) What is the direction of electric field – away from or toward the charge?

3. Explain how electric fields are like gravitation fields and how they differ. (3-4 sentences)

4. Move the test charge (also known as sensor) at different points around the charge. Measure its distance from the charge using measuring tape. Record your observations in a table that measures 10 observations, the position of the test charge, the Electric field and the ratio of the fields [2].

   Graph the table you just created with position of test charge on one axis, and electric field on the other axis.

5. **What conclusions can you draw about the electric field dependence on the distance of the field point from a point charge?** Answer this question based on the results of the ratio of the fields. Please use numbers to explain your answer. (2-3 sentences)

6. Keep the test charge fixed and add charges to the location original charge. Record your observations in a table that measures the charges 1, 2, 3, through adding 10 charges. Then also measure the electric field and ratio of the field's for each charge.

   What conclusions can you draw about the electric field dependence on the magnitude of a point charge? Answer this question based on the results of the ratio of the fields in table IV. Please use numbers to explain your answer. (2-3 sentences)

7. Drag the meter to a point close to the charge. Then click on the draw symbol (a pencil) on the meter. Take a snapshot of the equipotential line/surface.

   Replace +1 nC charge with -1nC charge, and repeat the previous part. Include both snapshots in your lab worksheet.

   Compare and contrast the equipotential lines // surfaces you observed in the snapshots of the last two parts. If you were to add field lines, how would they compare to the equipotential surface? Please reference chapter 23 in Young and Freedman for more information. (2-3 sentences)

8. **Practice drawing a circuit: Lightbulb**

   Looking at Fig. 8 which shows (from bottom left to right)

[1] For a point breakdown of each question in this lab please see the Rubric in the Lab 1R assignment submission page on Canvas.

[2] Please include units on all table headers

(a) the DC power supply (positive side) connected to an ammeter,

(b) then from the other side of the ammeter is connected to the switch,

(c) then from the switch to a lightbulb

(d) in parallel with the lightbulb is the voltmeter

(e) which then that is finally connected to the negative input of the DC power supply

Please re-draw Fig. 8 with the appropriate symbols used above in the style of Fig. 7. [3]

9. Construct a simple circuit with the following components: connecting wires, a resistor, a bulb, a battery, a switch, an ammeter, a voltmeter, such as in figure 9 (Although this one is missing the switch). Take a snapshot of the circuit you constructed and paste it into your worksheet. Label the various components of the circuit.

10. In the circuit you constructed in Question 9 measure the voltage across the resistor using a 'voltmeter' and the current in the circuit using an 'ammeter'.

Repeat your observations by increasing the voltage (adding batteries or changing the voltage value in the slide bar that appears when you select the battery) in the circuit. Record your observations in the following table: [4]

11. Transfer the data in Question 10 to a Jupyter Notebook and plot a graph, taking current (I) on the x - axis and voltage (V) on the y - axis. [5]

(a) Draw a curve of the best-fit on the graph, showing the equation of fit.

(b) What is the slope if the best fit line is linear.

(c) What physical quantity is this?

(d) Also copy the graph from Python and paste below.

In your caption please explain how the current in the circuit varies with the applied voltage – linearly or non- linearly? What physical quantity does the ratio of voltage (V) to current (I) give? What is the SI unit of this quantity? (2 sentences)

II Theory

II.1. Electric charge

Electric charge: A material object consists of atoms and molecules. An atom has positively charged nucleus with protons (proton charge, $+e = +1.60 \times 10^{-19}C$) and chargeless particles called neutrons, and a negatively charged cloud of electrons (electron charge, $-e = -1.60 \times 10^{-19}C$) surrounding the nucleus. An atom has equal number of electrons and protons with a net charge of zero, hence, an atom is electrically neutral.

If an atom loses one or more electrons, its net charge is positive. On the other hand, if it gains one or more electrons its net charge is negative.

When we rub two different objects like ebonite rod and muslin cloth, one of them loses electrons and becomes positively charged and the other one will gain electrons and is negatively charged.

II.2. Coulomb's Law

Two charged objects attract or repel each other with the force

$$\overrightarrow{F_{12}} = k\frac{|q_1 q_2|}{r_{12}^2}\hat{r}_{12} \tag{1}$$

where q_1 and q_2 are the charges on the two objects, r_{12} is the distance between them, and the $\hat{r}_{12}$ is the unit vector in the direction of the force, $\overrightarrow{F_{12}}$.

The constant of proportionality $k = \frac{1}{4\pi\eta_0} \approx 9.0x10^9 \frac{N \cdot m^2}{C^2}$.

If two charges are of the same sign, they repel each other, and the force is radially away from each other. If the two charges are of different signs, they will attract each other, and the force is radially towards each other (figure 10).

[3] You may draw it by hand, or using the Word Scribble function, but please make sure the quality is high enough for your lab instructor to read.

[4] Current's symbol is I, but it is measured in Amps so the A refers to the units of your values in that table column.

[5] If you do not wish to use Python you can use any other programming language (R, Matlab, C++, Excel, etc) you wish. If you need help with Python please either see #pythonhelp on our Slack channel, or our Github repository.

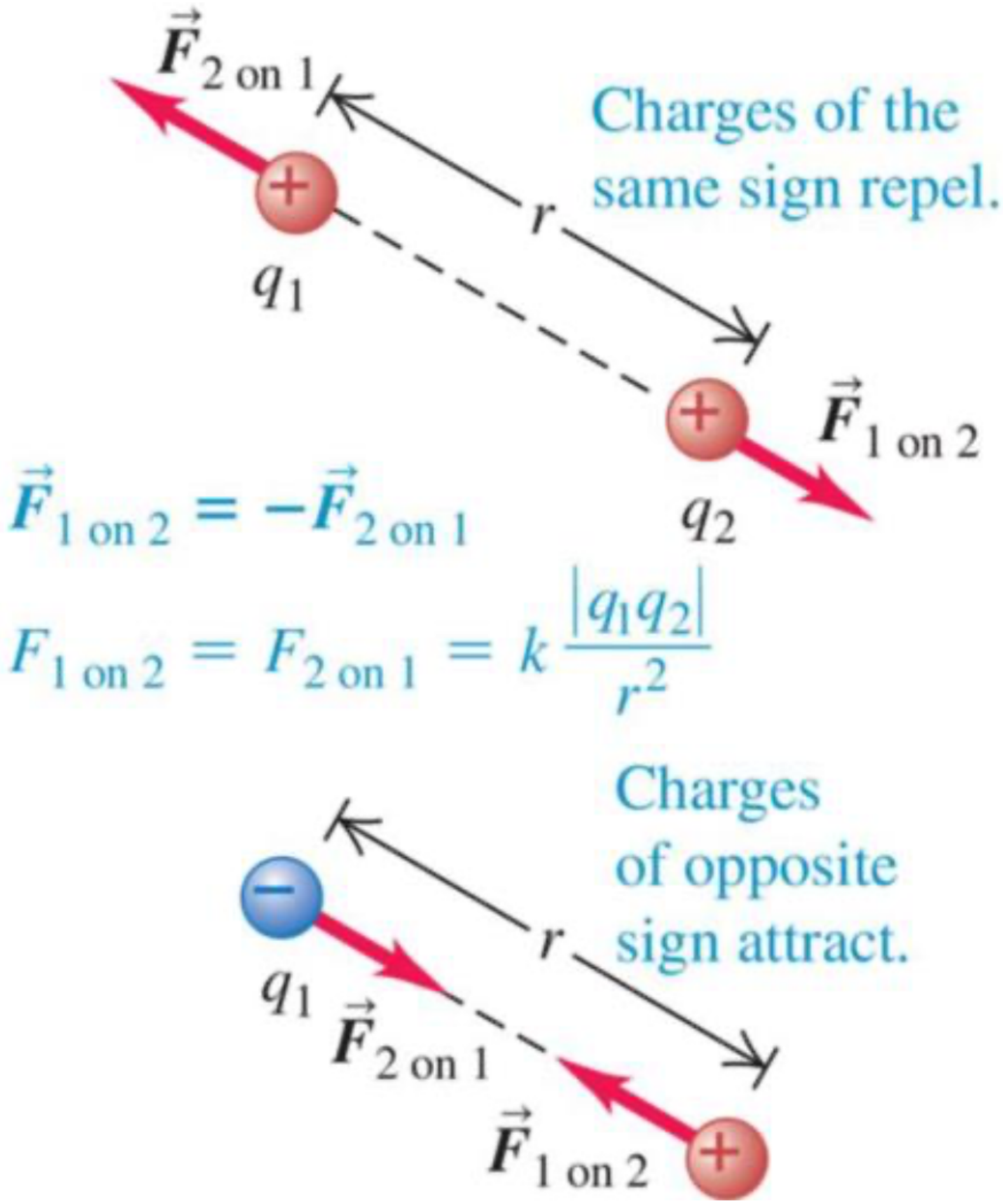


Figure 1: Coulomb force between two charges.

II.3. Electric field and electric field lines

There exists an electric field, $\overrightarrow{E}$ around a charge q. If a second charge, q_0, is placed in the electric field at a distance, r (2), it experiences a force $\overrightarrow{F}$, given by,

$$\overrightarrow{F} = q_0\overrightarrow{E} = k\frac{|q_o q|}{r^2}\hat{r}. \tag{2}$$

The unit vector $\hat{r}$ is in the direction of force that the charge q_o experiences. The electric field at any point due to a point charge can, therefore, be calculated by the formula

$$\overrightarrow{E} = k\frac{|q|}{r^2}\hat{r}. \tag{3}$$

The SI unit of elecric field is newton per coulomb (N/C).

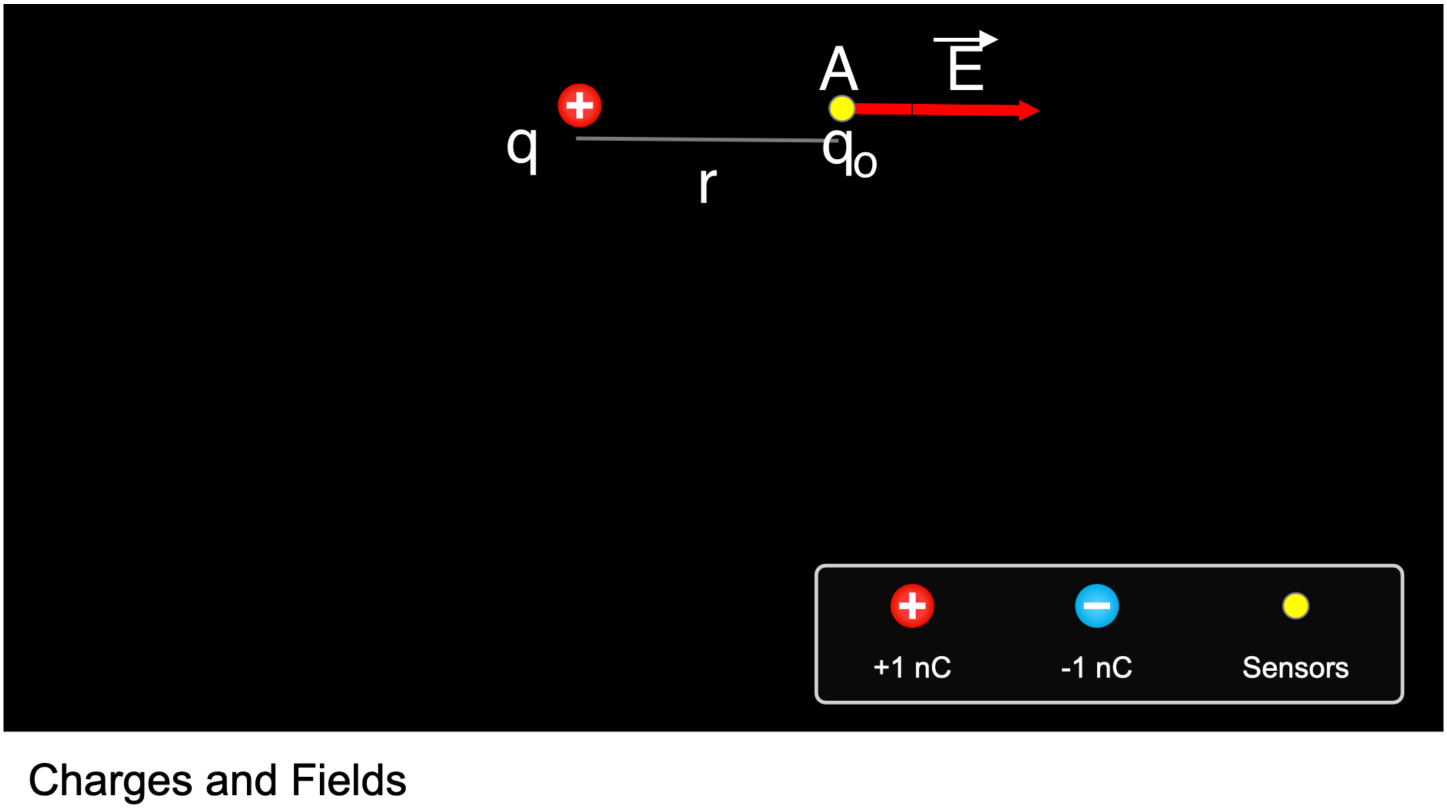


Figure 2: Coulomb force between two charges.

II.4. Electric field lines

Electric field lines map an electric field around a charge or charges. The electric field lines have the following properties:

1. They are smooth curves starting at a positive charge and ending at a negative charge.
2. The tangent at any point to a field line gives the direction of the field at that point.
3. They never intersect with each other.
4. The field lines are crowded around a charge where the electric field is strong and far separated away from the charge.

II.5. Electric polarization

Electric polarization: An atom is electrically neutral. But when it is placed in an external electric field, there is a shift of charge centers so that one side is slightly positive, and the other side is slightly negative. This is called electric polarization. This effect can be observed when we rub a comb in our dry hair on a dry day, and then bring it close to bits of paper. The paper bits are attracted toward the comb due to polarization effect.

II.6. Potential and potential difference

Electric potential at any point around a charge is the potential energy per unit charge, associated with that charge at that point. Mathematically,

$$V = \frac{U}{q} \tag{4}$$

Its SI unit is Joule per Coulomb or Volt (V) (1 V = 1 J/C).
For a point charge q, the potential at a distance r from the charge,

$$V = k\frac{q}{r} \tag{5}$$

The potential difference between two points A and B is given by

$$V_{AB} = V_B - V_A \tag{6}$$

where V_A and V_B are the potentials (Voltages) at points A and B respectively.

II.7. Equipotentials

Equipotentials: A line (or surface) which has all points at the same potential are called equipotential line (or surface). In Fig. 3, the green lines are equipotential lines around the positive point charge at the center. In three-dimensional space, these green lines are spheres and they are equipotential surfaces.

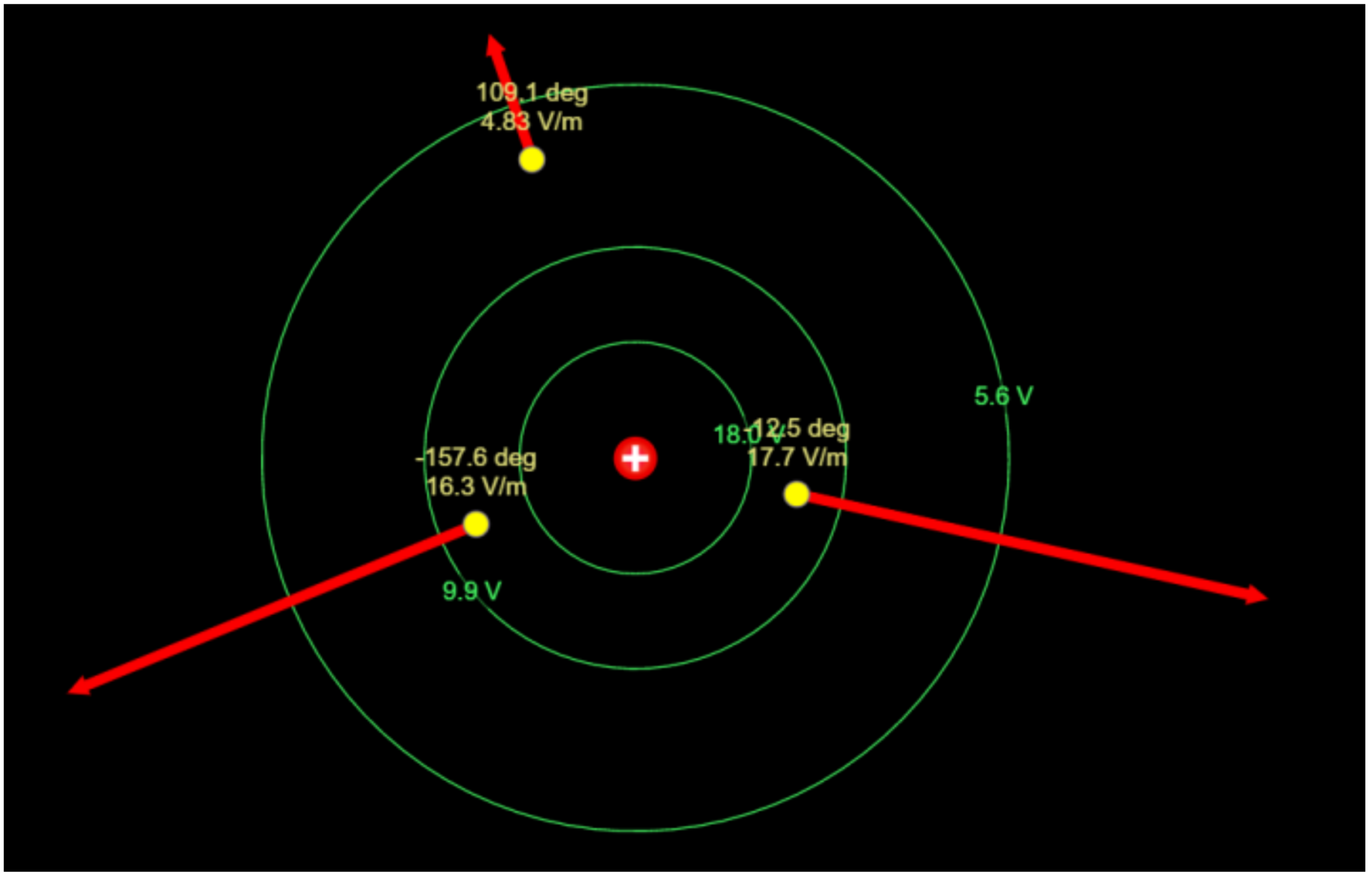


Figure 3: Equipotential lines/surfaces and electric field.

It has the following properties:

1. An electric field line is perpendicular to the equipotential line (or surface) at the point of intersection.
2. Equipotential lines/surfaces do not intersect each other.

What do you think are the red lines in Fig. 3 are?

III Procedure

Before you proceed, click on the following link and watch a short video for visualization of electric field and field lines: https://www.youtube.com/watch?v=63FnT0W-Hxc (Caution: DO NOT try to do the experiment shown in this YOUTUBE Video in home as this requires a very high voltage, which can be dangerous.)

Question 1 Introduction

Please write an introduction section based on the theory that you are working with today. For reference on what it should look like please consult the Generic Deliverables at this link.

IV Part A: Point charges

Click on the following link or copy and paste it in a web browser in your computer: PhET Colorado Charges and Fields.

You will see a blank black screen, such as Fig. 4. If you see something different please click on the Reset button, located at the bottom right.

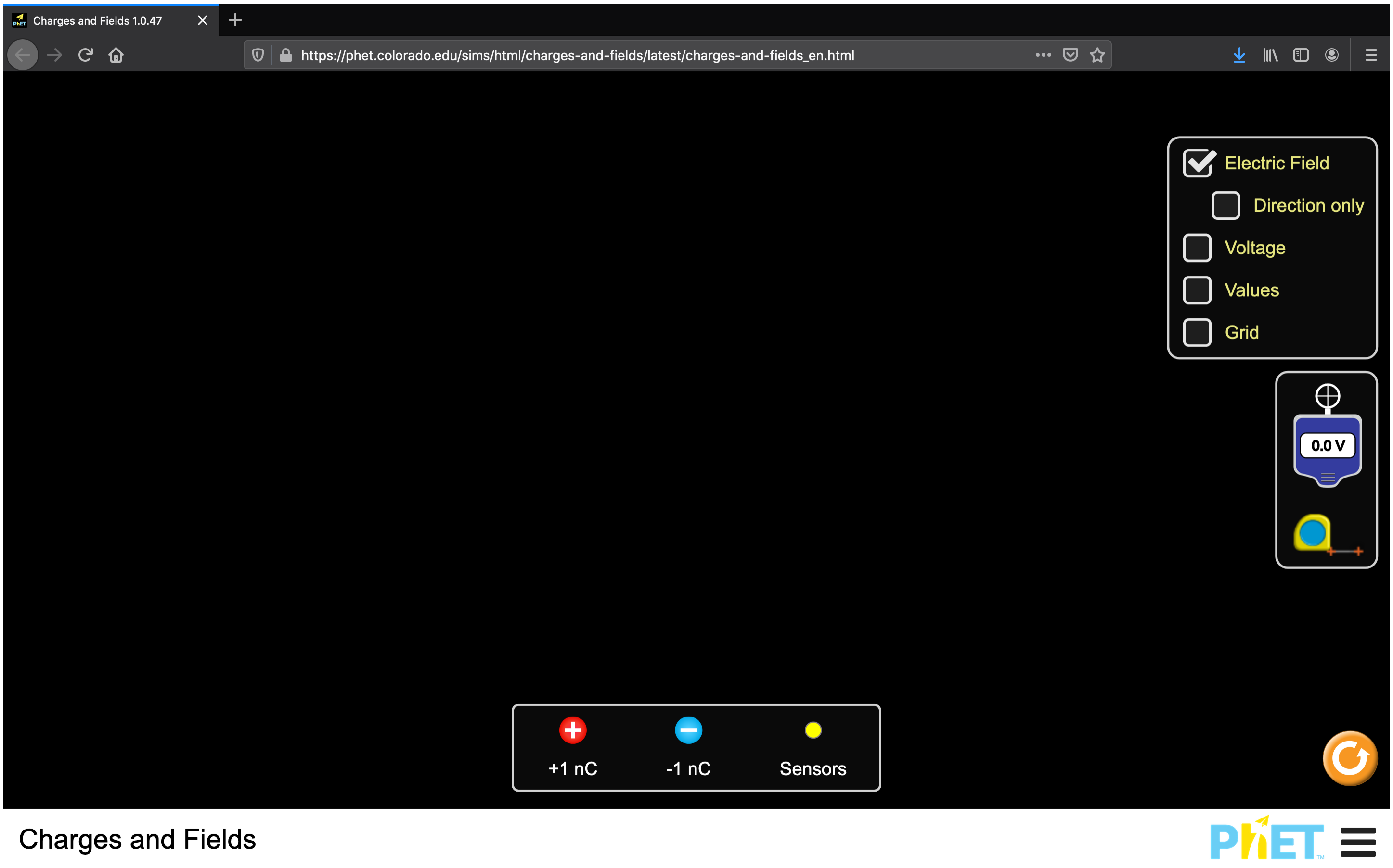


Figure 4: The PhET simulation of Charges and Fields, developed by the University of Colorado Boulder.

Question 2 *Drag a +1 nC charge to the center of the simulation window. In 1-2 sentences each answer the following questions:*[a]

1. *What is the direction of electric field – away from or toward the charge?*
2. *What do you think the relative brightness of the arrows show in this simulation?*

   Remove the +1 nC charge by dragging back into the box where it was located initially, and then drag a -1 nC charge to the center of the simulation window.
3. *Describe what you see in the simulation window now.*
4. *What is the direction of electric field – away from or toward the charge?*

[a]For a point breakdown of each question in this lab please see the Rubric in the Lab 1R assignment submission page on Canvas.

Question 3 *Explain how electric fields are like gravitation fields and how they differ. (3-4 sentences)*

Click on the Reset button and then on the Grid button located in the top right box of the simulation window. Drag a +1nC charge at one of the grid points at the center of the window. Uncheck the Electric Field button and check the Values button. Drag a test charge (labeled sensor in the PhET) to a point (5 square units away to the right from the +1nC charge, see Fig. 5).

Question 4 *Move the test charge (also known as sensor) at different points around the charge. Measure its distance from the charge using measuring tape. Record your observations in a table that measures 10 observations, the position of the test charge, the Electric field and the ratio of the fields* [a]*.*

Graph the table you just created with position of test charge on one axis, and electric field on the other axis.

[a]Please include units on all table headers

Question 5 ***What conclusions can you draw about the electric field dependence on the distance of the field point from a point charge?*** *Answer this question based on the results of the ratio of the fields. Please use numbers to explain your answer. (2-3 sentences)*

Example table for question 10			
Obs. No.	Position of test charge (m)	Electric field (V/m)	Ratio of the fields
1	$r_1 =$	$E_1 =$	$\frac{E_1}{E_1} =$
2	$r_2 =$	$E_2 =$	$\frac{E_2}{E_1} =$
3	$r_3 =$	$E_3 =$	$\frac{E_3}{E_1} =$
4	$r_4 =$	$E_4 =$	$\frac{E_4}{E_1} =$
5	$r_5 =$	$E_5 =$	$\frac{E_5}{E_1} =$
...	$r_{...} =$	$E_{...} =$	$\frac{E_{...}}{E_1} =$
10	$r_{10} =$	$E_{10} =$	$\frac{E_{10}}{E_1} =$

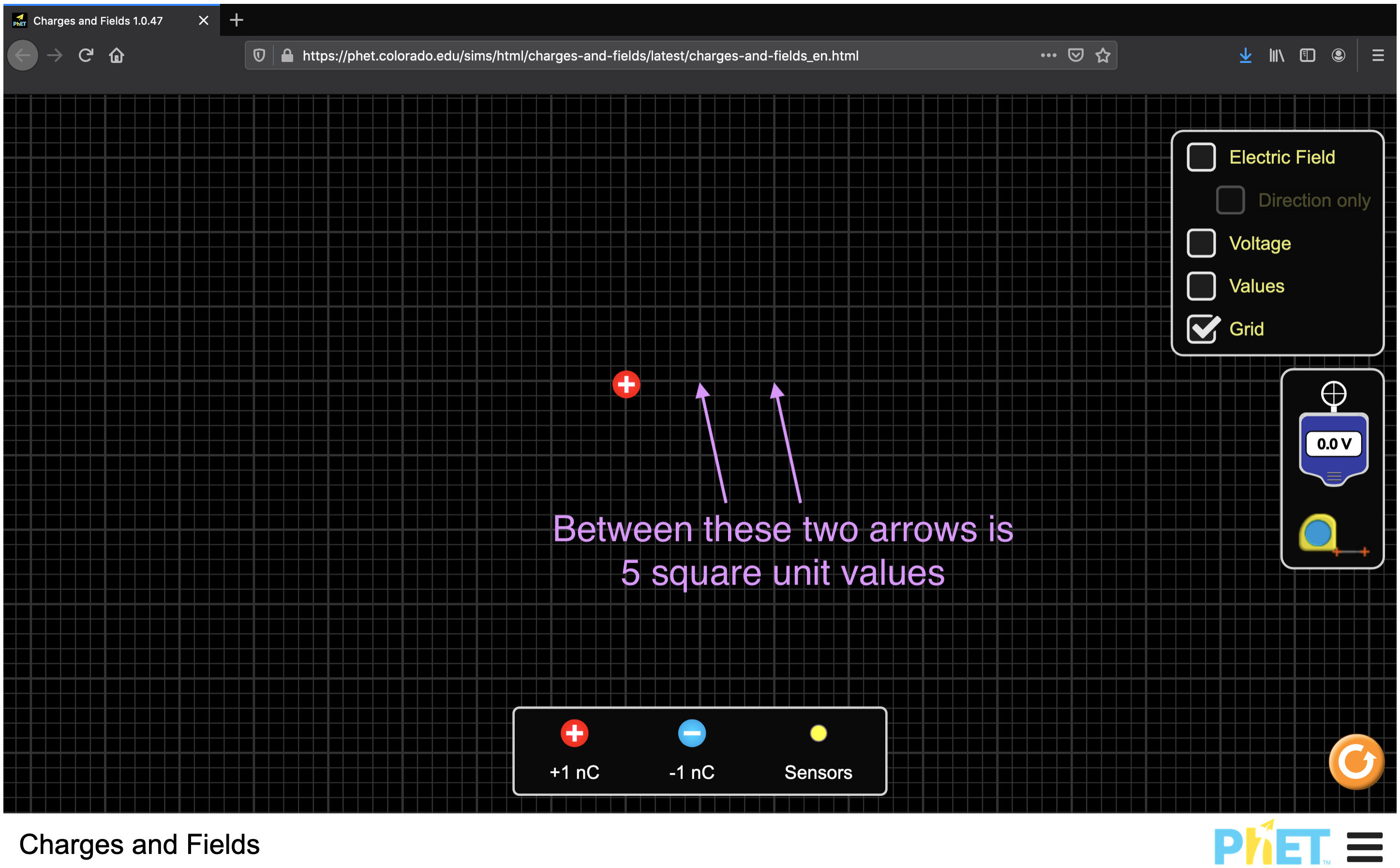


Figure 5: Visual explanation of 5 square units.

Click on the Reset button and then on the Grid button located in the top right box of the simulation window. Drag a +1nC charge at one of the grid points at the center of the window. Uncheck the Electric Field button and check the Values button. Drag a test charge to a point (5 square units away to the right from the +1nC charge).

Question 6 *Keep the test charge fixed and add charges to the location original charge. Record your observations in a table that measures the charges 1, 2, 3, through adding 10 charges. Then also measure the electric field and ratio of the field's for each charge.*

What conclusions can you draw about the electric field dependence on the magnitude of a point charge? *Answer this question based on the results of the ratio of the fields in table IV. Please use numbers to explain your answer. (2-3 sentences)*

Example table for question 6			
Obs. No.	Amount of charge (nC)	Electric field (V/m)	Ratio of the fields
1	$q_1 = 1$	$E_1 =$	$\frac{E_1}{E_1} =$
2	$q_2 = 2$	$E_2 =$	$\frac{E_2}{E_1} =$
3	$q_3 = 3$	$E_3 =$	$\frac{E_3}{E_1} =$
4	$q_4 = 4$	$E_4 =$	$\frac{E_4}{E_1} =$
5	$q_5 = 5$	$E_5 =$	$\frac{E_5}{E_1} =$
...	$q_{...} =$	$E_{...} =$	$\frac{E_{...}}{E_1} =$
10	$q_{10} =$	$E_{10} =$	$\frac{E_{10}}{E_1} =$

Click on the Reset button and then on the Grid button, located in the top right box of the simulation window. Drag a +1nC charge at one of the grid points at the center of the window. Uncheck the Electric Field button, check the Voltage and Values buttons. You will see the simulation window as shown in Fig. 6.

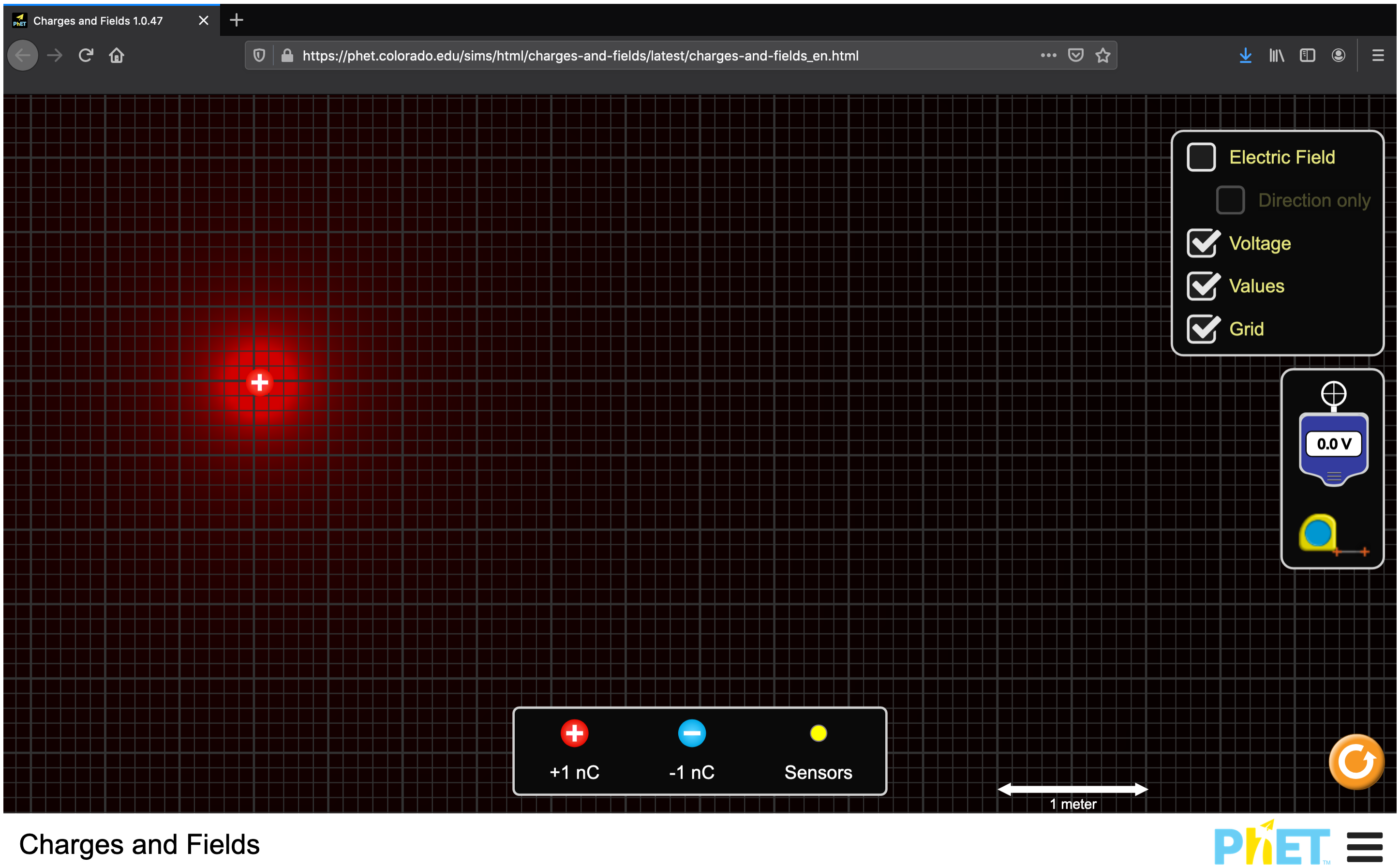


Figure 6: Simulation window with Grid, Voltage and Values enabled.

Question 7 *Drag the meter to a point close to the charge. Then click on the draw symbol (a pencil) on the meter. Take a snapshot of the equipotential line/surface.*

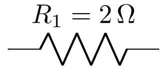
Replace +1 nC charge with -1nC charge, and repeat the previous part. Include both snapshots in your lab worksheet.

Compare and contrast the equipotential lines // surfaces you observed in the snapshots of the last two parts. If you were to add field lines, how would they compare to the equipotential surface? Please reference chapter 23 in Young and Freedman for more information. (2-3 sentences)

V Part B: Circuit Skills

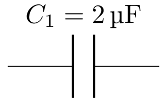
Drawing Circuits

$R_1 = 2\,\Omega$



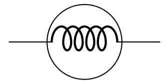
Resistors are drawn as in image above with the label $R_1 = 2\,\Omega$. The unit of resistance is the Ω symbol, which is called an ohm. It's SI base unit is $kgm^2s^{-3}A^{-2}$.

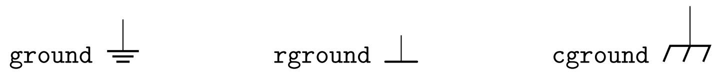
$C_1 = 2\,\mu\text{F}$



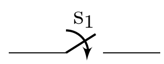
Capacitor's are drawn as in image above with the label $C_1 = 2\mu F$. The μF symbol is called an micro Farad. It's SI base unit is $1kg^{-1}m^{-2}s^4A^2$.

This is the symbol for a lightbulb, and we will be using this a lot today. Today you will work with the LED and a resistor to plot their voltage vs current curves (also known as an I-V) curve.



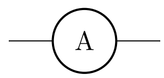


The symbols above are all possible symbols for 'ground'. On your power supplies you will often see the 'ground' or GND marking. They are often green on your power supplies.

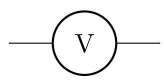


The diagram above is a switch. When a switch is 'open' the circuit is off and current cannot flow through a circuit. When a switch is 'closed' the circuit can run.

Measurement symbols



The A above represents where an Ammeter should be placed. Ammeters measure current, and should always be placed in series (interrupting the connection between two components) on a circuit. You will learn more about series versus parallel connections later in this lab.



Above is the symbol of a voltmeter. Voltmeters measure voltage, and should always be placed parallel to a circuit. As you can see in Fig. 8 the voltmeter symbol is placed such that it spans a resistor.

The full circuit diagram for the lightbulb will be

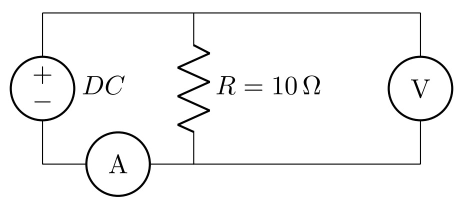


Figure 7: This is an example circuit diagram. On the left we have the DC power supply input. In the middle is the lightbulb. On the right is the voltmeter, which is parallel to the lightbulb. Then on the bottom of the circuit is the ammeter, which is in series with the lightbulb and DC power supply.

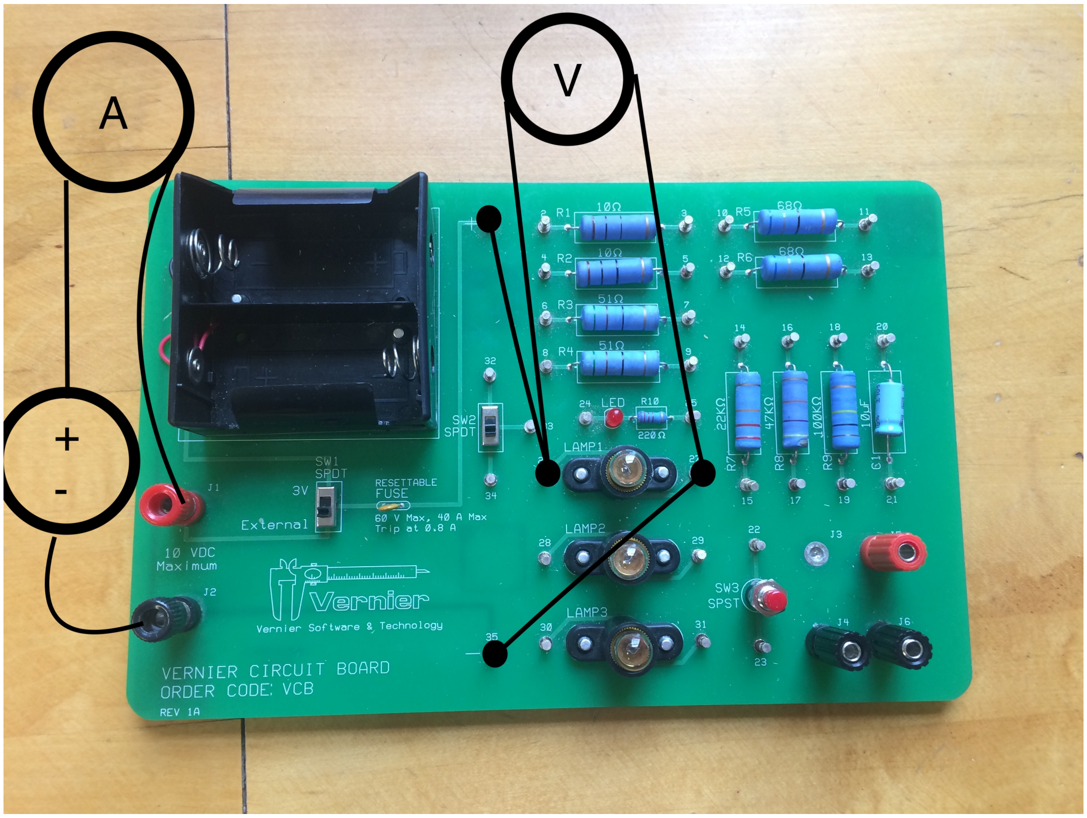


Figure 8: Detailed view of the connections with a lightbulb as the device under test.

Question 8 Practice drawing a circuit: Lightbulb

Looking at Fig. 8 which shows (from bottom left to right)

1. *the DC power supply (positive side) connected to an ammeter,*
2. *then from the other side of the ammeter is connected to the switch,*
3. *then from the switch to a lightbulb*
4. *in parallel with the lightbulb is the voltmeter*
5. *which then that is finally connected to the negative input of the DC power supply*

Please re-draw Fig. 8 with the appropriate symbols used above in the style of Fig. 7. [a]

[a] You may draw it by hand, or using the Word Scribble function, but please make sure the quality is high enough for your lab instructor to read.

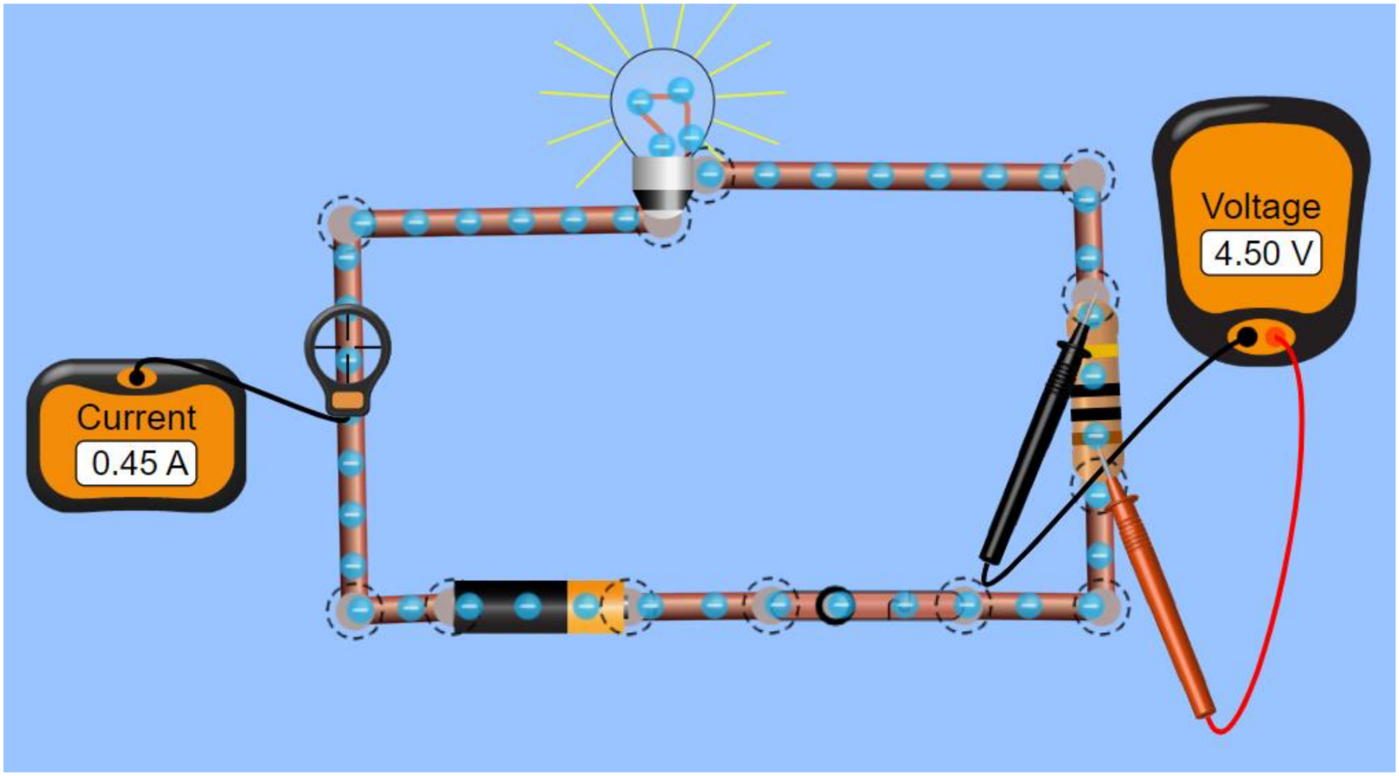


Figure 9: Example circuit in the PhET.

Part C: Circuit Theory

Electric Circuit

An electric circuit is a path for the flow of electric charge carriers (electrons and ions). A simple electric circuit consists of a source of potential difference (p.d.) like a battery or a power supply, connecting wires, a resistor, and a switch. A circuit in which a current is flowing is called a closed circuit and a circuit with an open switch or circuit-breaker is called an open circuit. When a p.d. is maintained in a closed circuit, the charges flow and the flow constitutes a current. Thus, we define an electric current as the rate of flow of charge. Mathematically,

$$I = \frac{dQ}{dt} \tag{7}$$

where dQ is the amount of charge that passes through the cross-section of a wire in time interval dT. In a metallic conductor, the current is formed by the flow of electrons (charge $= -1e = -1.610^{-19}C$). The electrons flow from the negative terminal of a battery to its positive terminal through the external circuit.

Conventionally, the direction of current is considered in the direction opposite to the direction of motion of electrons, and this is called the conventional current. The SI unit of current is Ampere (A). If 1 Coulomb of charge flows through a cross-section of a conductor in 1 second, the current is 1 Ampere:

$$1A = \frac{1C}{1s} = 1Cs^{-1}. \tag{8}$$

Since 1A is a fairly large amount of current, the commonly used submultiples of ampere are milliampere ($1mA = 10^{-3}A$) and microampere ($1\mu A = 10^{-6}A$).

To maintain a current in an electric circuit, we need to apply a potential difference (p.d.) or voltage across the circuit. It can be done by using the sources of electric energy like a battery or a power supply connected to an alternating current source.

Ohm's Law

When a potential difference is applied across a resistor, it causes a flow of current through it. Ohm's law states that the current flowing through the resistor is directly proportional to the potential difference applied, provided that the temperature of the resistor remains constant. Mathematically,

$$I \propto V \tag{9}$$

If I is the current (in amperes) flowing through the resistor and V is the potential difference (in volts), then, Ohm's law can be written as above. This means that if the voltage (V) across a resistor is increased, the current (I) increases linearly.

We can write Eq. 9 as

$$V = RI \tag{10}$$

where R is the proportionality factor, and it is called the resistance of the resistor. The SI unit of resistance is Ohm (Ω). For metallic wires at constant temperature, the resistance of a given resistor is constant. Note that p.d. (or voltage) is measured by a voltmeter which is connected in parallel to the resistor across which the p.d. is to be measured and current is measured by an ammeter which is connected in series in the circuit.

Resistance

Electrical resistance is the property of materials which opposes the flow of charges through them. The resistance is usually denoted by R and the SI unit is Ohm (Ω).

The ratio of the voltage applied across a resistor to the current flowing through it gives the resistance of the resistor.

$$\frac{V}{I} = R. \tag{11}$$

For a simple metallic resistor at normal temperatures, R is constant. The resistors which demonstrate this behavior are called Ohmic conductors. Semiconductor diode, ionized gases, and the glowing filament in a bulb the ratio $\frac{V}{I}$ is not constant. They are, therefore, are called Non- Ohmic conductors. The resistance of a wire given by

$$R = \rho \frac{L}{A}. \tag{12}$$

where L is the length of the wire, A is its area of cross-section, and ρ is called the resistivity of the material of the wire.

The following figure shows a simple electric circuit with a battery which has an internal resistance r = 2 Ω. The battery has an emf η = 12 V. An external resistance R = 4 Ω is connected in the circuit.

Before you proceed, click on the following link and watch a short video for the circuit- construction in a 'real' lab: Circuit in a real lab

Click on the following link or copy and paste it in a web browser in your computer: **PhET Circuit Construction Kit.**

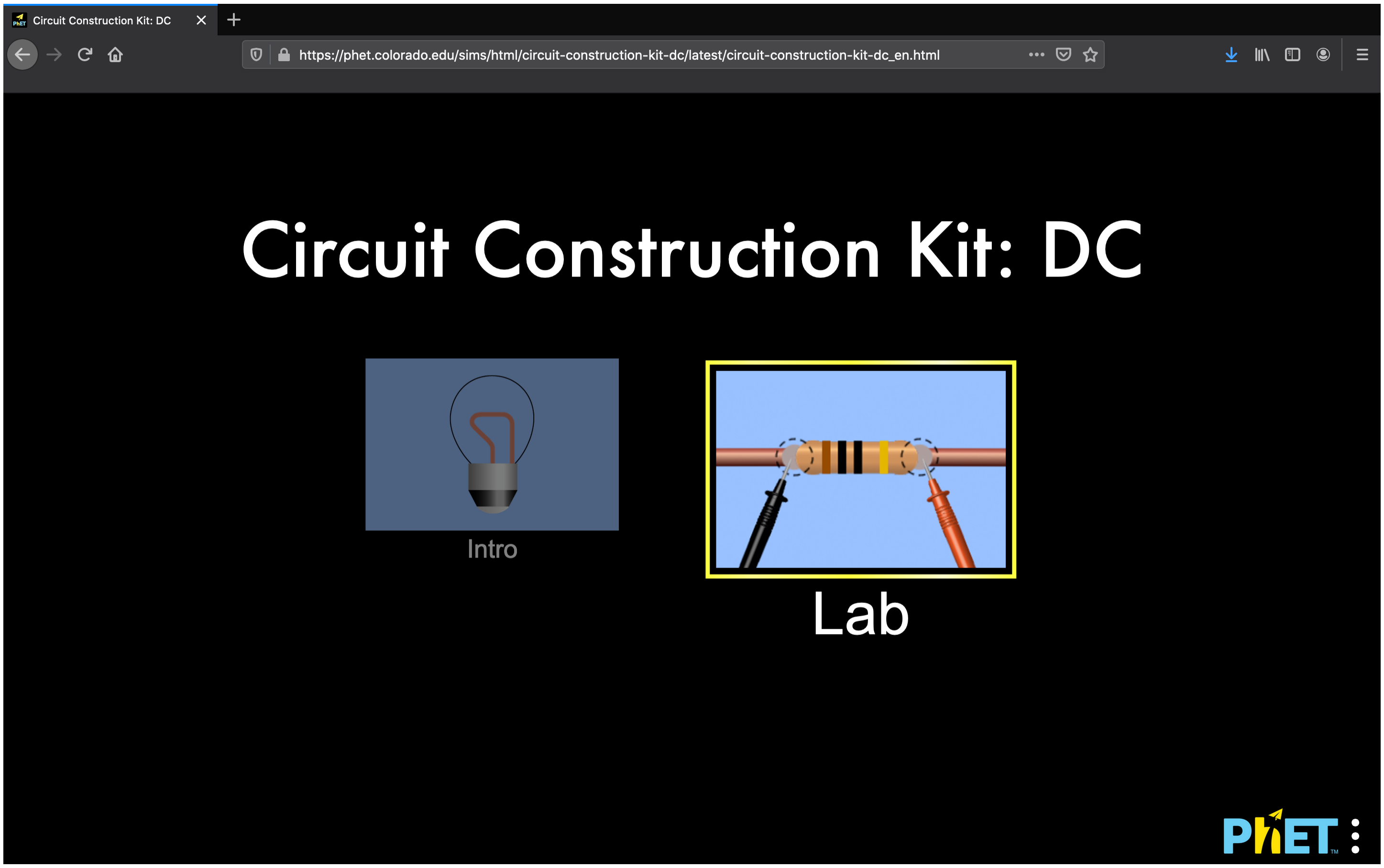


Figure 10: Select the lab option.

Question 9 *Construct a simple circuit with the following components: connecting wires, a resistor, a bulb, a battery, a switch, an ammeter, a voltmeter, such as in figure 9 (Although this one is missing the switch). Take a snapshot of the circuit you constructed and paste it into your worksheet. Label the various components of the circuit.*

Question 10 *In the circuit you constructed in Question 9 measure the voltage across the resistor using a 'voltmeter' and the current in the circuit using an 'ammeter'.*

Repeat your observations by increasing the voltage (adding batteries or changing the voltage value in the slide bar that appears when you select the battery) in the circuit. Record your observations in the following table: [a]

[a] Current's symbol is I, but it is measured in Amps so the A refers to the units of your values in that table column.

Table for question 10			
Obs. No.	Voltage (V)	Current (A)	Ratio of V to I ($\frac{V}{I}$)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Question 11 *Transfer the data in Question 10 to a Jupyter Notebook and plot a graph, taking current (I) on the x - axis and voltage (V) on the y - axis.* [a]

1. *Draw a curve of the best-fit on the graph, showing the equation of fit.*
2. *What is the slope if the best fit line is linear.*
3. *What physical quantity is this?*
4. *Also copy the graph from Python and paste below.*

In your caption please explain how the current in the circuit varies with the applied voltage – linearly or non- linearly? What physical quantity does the ratio of voltage (V) to current (I) give? What is the SI unit of this quantity? (2 sentences)

[a] If you do not wish to use Python you can use any other programming language (R, Matlab, C++, Excel, etc) you wish. If you need help with Python please either see #pythonhelp on our Slack channel, or our Github repository.

Extra Credit

Extra credit in lab only applies to lab. So if lab counts for 20% of your grade in this class, you can get a total of 20 points factored into your final grade. You cannot get over a 100% lab grade. Extra credit in lab is meant to be a challenging, interesting way to gain some points you may have lost for small errors. The extra credit assignments are often things we would love to include in the main experiment, but we just are not sure if there would be time in the two hours assigned to lab.

Question 12 Extra Credit: Creative Safety Rules Reinforcement

For up to 3 points of extra credit please create your own Electronics Safety Meme! They do not have to be good (see Fig. 11), but please integrate one of our four safety rules, and state which rules you're trying to convey.

Lab Instructor's have final discretion if your meme makes sense or not. But again, you just have to be as good as or better than Fig. 11. Please include a comment in your figure caption for the meme that includes these two things. First, what safety rule you are trying to demonstrate, and secondly, if we are allowed, or not allowed, to post your meme on our lab instagram page. If you are fine with us posting your meme, please include how you'd want to be attributed.

Partners cannot submit the same meme.

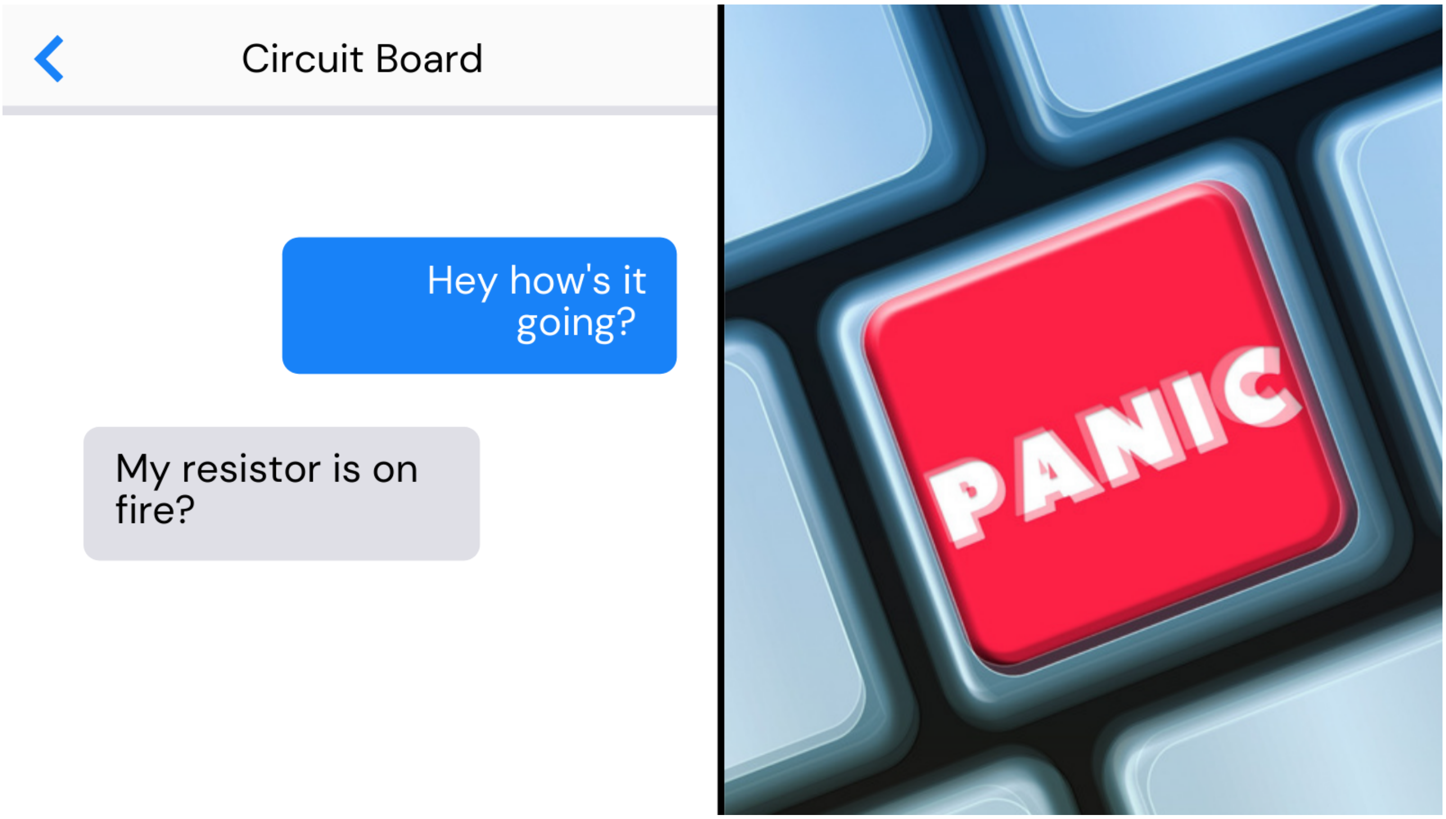


Figure 11: Here you can see a meme, indicating one of the four safety rules of electronics lab. This one is meant to exemplify rule number 3 (IF YOU SMELL ANYTHING BURNING OR YOUR RESISTOR IS WARM TO THE TOUCH TURN THE POWER OFF AT ONCE.). As it says, once the circuit board's resistor is on fire one can Panic, but then turn off the power supply and let my Lab Instructor know. // You can use this meme on the instagram page, but anonymously

VI Conclusion

When you have completed all the questions please save your answers as a PDF, and upload them to the Canvas assignment associated with this lab. If you have trouble converting to a PDF please ask your Lab Instructor(s) for help.

VII Acknowledgement

This lab was first developed by Dr. Rudra Kafle to replace the on-site labs for D term, 2020 due to the COVID-19 Emergency. They have been iterated upon by Dana, who takes full credit for any mistakes therein. [**?**].

The Figures and Caption Rules

There are a few very important aspects to creating a proper figure and caption. If you follow these rules, not only will you get points on your physics lab grades, you will impress your instructors and peers in the future.

The Caption

- The caption should start with a label so you can reference the figure from other places in your paper/report. For this course you should use “Figure 1”, “Figure 2”, etc.
- The caption should allow the figure to be standalone, that is to say, by reading the caption and looking at the figure, it should be clear what the figure is about and why it was included without reading the whole paper.
- The caption should contain complete sentences and be as brief as possible while still conveying your information clearly (this is not always easy).
- Please add captions to your tables as well, otherwise we will not know what we are looking at.

The Figure

- **Make sure that the resolution is high enough to not be pixelated at its final size.**
- Check that any text is readable at the final size (Using a smaller graph in Logger Pro will cause the text to be larger in relation to the graph when inserted into another program).
- For graphs, ensure that the axes are labeled (including units) and that there is a legend if you have multiple data sets on the same graphs.

Tables

- The first row of the table should be a header, where each item is labeled with what is contained in that row. If it is a physical measurement it should have the correct units.
- For tables include a short caption of what is contained in the table, or what was examined.
- The caption should start with a label so you can reference the figure from other places in your paper/report. For this course you should use “Table 1”, “Table 2”, etc. For an example of a good table caption please see Figure 12.

Table 1. Baseline characteristics of study participants

Variables	Intervention group (n=14)	Control group (n=15)
Women (no [%])	7 (50)	5 (33)
Median age (range)	22.0 (19 – 58)	21.0 (18 – 70)
First winter in icy conditions (no [%])	—	1 (7)
Previous falls on ice (no [%])	8 (57)	11 (73)
$\geq$ 1 fall this winter (no [%])	4 (29)	7 (50)
Injury from fall this winter (no [%])	1 (7)	—
Time been walking this route (no [%]):		
<6 months	3 (21)	2 (13)
6–12 months	9 (64)	9 (60)
>12 months	2 (14)	4 (26)

Figure 12: An example table from the paper Lianne Parkin, Sheila M Williams, and Patricia Priest, “Preventing Winter Falls: A Randomised Controlled Trial of a Novel Intervention” 122, no. 1298 (2009): 9.