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Part I - Straight Wire

Open the “Straight Wire” simulation. You should notice that the electric field arrows point away from the positive charge and toward the negative charge.

1. When you hit the “play” button, which way do the electrons move?

(In the same direction as the electric field / in the opposite direction of the electric field)

2. After a while, you should notice that color starts appearing on the surface of the conductor.

The surfaces near the positive charge become (positively charged / negatively charged).

The surfaces near the negative charge become (positively charged / negatively charged).

3. For the next two questions, you might need to restart and pause the simulation a few times:

a. As electrons COLLIDE with a surface, the surface turns (blue / red). This indicates that the surface is becoming (negative / positive).

b. As electrons LEAVE a surface, the surface turns (blue / red). This indicates that the surface is becoming (negative / positive).

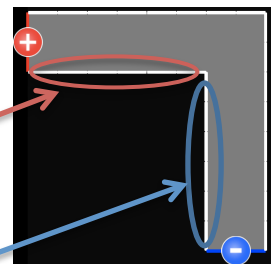
4. Let the simulation run for a long time. After a while, the arrows all point directly to the right, rather than away from the original positive charge and toward the original negative charge. Why did the arrows change directions slightly?

Part II - Bent Wire

5. Switch to the bent wire simulation. Initially, most of the surface is uncharged (white). If you let the simulation run for a while, you will notice that the left side of the vertical wire turns blue and the bottom side of the horizontal wire turns red. Why is this?

a. The bottom side of the horizontal wire turns red because ...

b. The left side of the vertical wire turns blue because ...



6. After a long time, what happens to the direction of the field arrows in the wire?

Part III - Electron Flow in a Circuit

7. Run the “Simple Circuit” and “Snaky Circuit” simulations. Initially, the field arrows (are aligned with / are not aligned with) the wires. After a long time, the field arrows (are aligned with / are not aligned with) the wires

8. Why do the field arrows adjust over time?

9. Select the “Snaky Circuit” simulation. You will notice that there is an area where the electrons are initially flowing the wrong way:

a. Let the simulation run and draw the resulting surface charges on the diagram at right. Use red “+” symbols and blue “-” symbols:

b. What direction are the electrons in this region initially moving?

(right / left)

c. After the surface charge builds up, what direction do the electrons in this region move?

(right / left)

d. Using the surface charges on the diagram, explain why the direction of motion switches.

