Coin Batteries

Now that you know a little bit more about how batteries work and the relationship between force and charge, we will create our own batteries out of nickels and pennies. We will then hook up the battery to a multimeter in order to collect the necessary information on potential difference. In order to complete this activity, perform the following procedure:

1. Obtain a stack of pennies, nickels, plastic cup, salt, paper towel, and multimeter.
2. Pour two tablespoons of salt into the plastic cup with 6 ounces of water.
3. Cut the paper towels into squares smaller than a nickel and moisten them with the salt water solution.
4. Place a paper towel square on top of a nickel and place a penny on top of that. This is one unit in the battery.
5. Stack 3 units together with the nickel from the next unit directly on top of the penny.
6. Place one side of the multimeter on top of the battery and one side on the bottom. Measure the potential difference.
7. With your lab group, decide on a variable to manipulate and measure the impact it has on electric potential. Some options include the number of units in the battery, the type of coins, or the concentration of salt water. Use the investigation proposal sheet attached to plan your investigation for approval.

After carrying out your investigation, use an appropriate technological tool (Excel, Google Sheets, etc.) to present your data in a meaningful way. You will also write a claim, evidence, and reasoning paragraph to illustrate your understanding of the investigation and the underlying principles it pertains to, specifically, the effect that charge has on force and potential difference.
## Investigation Proposal

**Problem:** Identify the relationship you are trying to identify below:

**Materials:** List any and all materials you will require for this investigation below:

<table>
<thead>
<tr>
<th>Materials: List any and all materials you will require for this investigation below:</th>
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**Variables:** Identify the variables for your investigation:

- Independent:
- Dependent:
- Controlled variables:

**Procedure:** Describe how you will solve the problem listed above. Consider how you will manipulate and control the variables listed above

1. 
2. 
3. 
4. 
5. 
6. 

**Data Table:** Create a data table(s) and sketch the axis of a graph (label x and y) that will help you collect all of the necessary information below:
After carrying out your investigation, write you claim, evidence, and reasoning paragraph as well as you data presented using the appropriate technological tool. The attached rubric will provide you with clear expectations for the assignment.

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<tbody>
<tr>
<td><strong>Claim (Worth 1 point)</strong></td>
<td>Student makes a definitive statement regarding the relationship between the variables investigated.</td>
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<td><strong>Evidence</strong></td>
<td>The student cites only necessary data that supports claim.</td>
<td>Student cites necessary data, but may include inappropriate or unnecessary data.</td>
<td>Student provides insufficient data to support claim OR includes considerable amounts of inappropriate or unnecessary data.</td>
<td>Student does not provide evidence or provides inappropriate evidence.</td>
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<td><strong>Reasoning</strong></td>
<td>Student provides substantial reasoning to link evidence to the claim. Reasoning uses scientific principles to connect evidence and claim.</td>
<td>Student provides reasoning to connect evidence to claim but may have gaps in explaining why evidence is supportive.</td>
<td>Student provides reasoning that does not address the appropriate claim or connect the correct evidence.</td>
<td>No reasoning is not provided or reasoning is completely illogical.</td>
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<tr>
<td><strong>Data Presentation</strong></td>
<td>Student presents data in an accurate and appropriate manner. The presentation tool utilizes appropriate technology and contains all aspects essential to data presentation (labels, units, trendlines, etc.)</td>
<td>Student presents data in an accurate and appropriate manner. The presentation tool is appropriate and contains most aspects essential to data presentation but has some omissions.</td>
<td>Student presents data in a somewhat logical and concise manner, but may contain some irrelevant or inaccurate data. OR The presentation tool is inappropriate or is missing several key components essential to data presentation.</td>
<td>Student does not present data or data is presented in an entirely illogical or inappropriate manner.</td>
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