Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Coulomb’s Law Investigation**

**Set Up**

Go to “My Computer” in the start menu. Open the shared drive. Navigate to “Student Share”. Navigate to “Science”. Click on “Physics 1”. Open the “Static Electricity” folder. Open the simulation in the folder.

**Part 1: Understanding the Basics of the Electric Force**

1. Do these particles have the same charge or opposite charge? How can you tell? Draw a picture of the charges to support your explanation.
2. Who is causing the force on the blue charge?
3. Who is causing the force on the red charge?
4. How does the force on the blue charge compare to the size of the force on red charge? Why is this? (*hint: use Newton’s 3rd Law to support your answer)*
5. If you double the charge of the blue charge...
   1. what do you think will happen to the force on the red charge?
   2. what do you think will happen to the force on the blue charge?
6. Now, test your prediction and double the charge of the blue charge.
   1. What happened to the force on the red charge? Why?
   2. What happened to the force on the blue charge? Why?

**Part 2:** **Investigating the Relationship between Charge and the Electric Force**

1. Change the amount of charge on the blue charge according to the table below and record the force.

|  |  |  |  |
| --- | --- | --- | --- |
| Distance of Separation | Blue Charge | Red Charge | Force |
| 2 cm | 1 mC | 1 mC |  |
| 2 cm | 2 mC | 1 mC |  |
| 2 cm | 3 mC | 1 mC |  |

1. Using your data above to support your answer, by what factor did the force change...
   1. when the charge was doubled?
   2. when the charge was tripled?
2. What is the relationship (directly or indirectly proportional) between force and charge?
3. If we were to increase the blue charge to 10 mC, what would the magnitude of the force be on the charges now? Show your work.
4. If we were to now double the magnitude of the blue charge and double the magnitude of the red charge, how much bigger would the force now be?
5. Let’s test your answer to the question above. Change the amount of charge on the blue charge and red charge according to the table below and record the force.

|  |  |  |  |
| --- | --- | --- | --- |
| Distance of Separation | Blue Charge | Red Charge | Force |
| 2 cm | 1 mC | 1 mC |  |
| 2 cm | 2 mC | 2 mC |  |
| 2 cm | 3 mC | 3 mC |  |

1. Using your data above to support your answer, by what factor did the force change...
   1. when both the charges were doubled?
   2. when both the charges were tripled?
2. Is the force directly proportional to only one of the charges or both charges? Explain how you know.
3. What would the magnitude of the force be if the blue charge was 4 mC and the red charge was 2 mC? Show your work.
4. Test your prediction, to the question above. If it was wrong, analyze why it was wrong.
5. What would the magnitude of the force be if the blue charge was 10 mC and the red charge was 10 mC? Show your work.

**Part 2: Investigating the Relationship between Distance of Separation and the Electric Force**

1. Change the distance of separation between the charges according to the table below and record the force.

|  |  |  |  |
| --- | --- | --- | --- |
| Distance of Separation | Blue Charge | Red Charge | Force |
| 2 cm | 1 mC | 1 mC |  |
| 4 cm | 1 mC | 1 mC |  |
| 6 cm | 1 mC | 1 mC |  |

1. Using your data above to support your answer, by what factor did the force change...
   1. when the distance of separation was doubled?
   2. when the distance of separation was tripled?
2. What is the relationship (directly or indirectly proportional) between force and distance of separation?
3. If the distance of separation were now increased to 12 cm, what would the magnitude of the force be now? Show your work.