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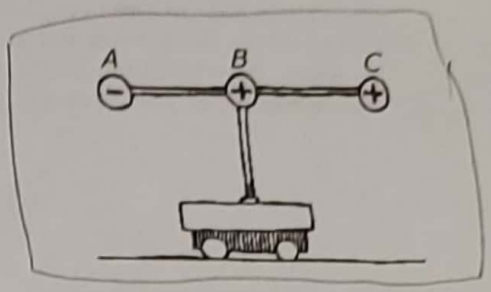
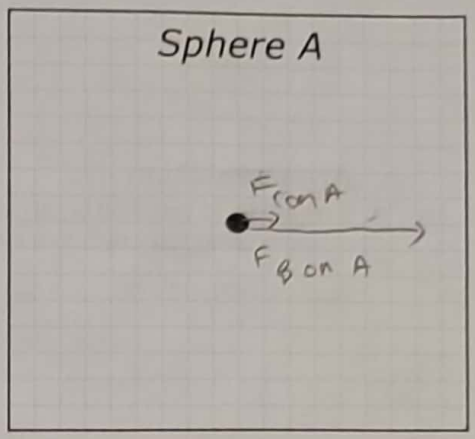
Scenario

A cart supports three metal spheres, as shown. The cart and the rods supporting the spheres are all very light and nonconducting. Sphere A and Sphere C are the same distance from Sphere B. All three spheres have the same magnitude charge. The cart sits at rest on a smooth table.

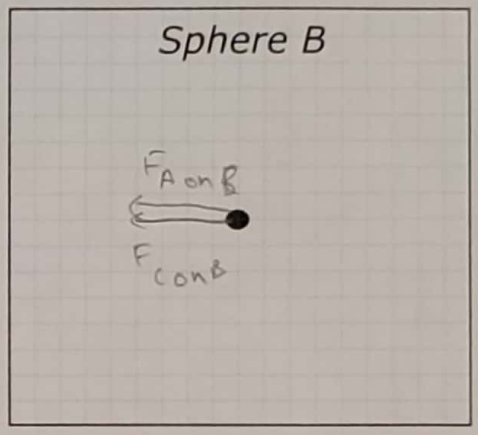


Using Representations

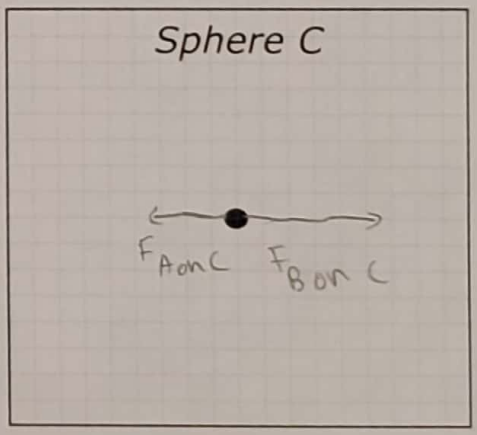
PART A: The dot to the right represents Sphere A. Draw a free-body diagram showing and labeling the electric forces only (not components) exerted on Sphere A from the other two spheres. Draw the relative lengths of all vectors to reflect the relative magnitudes of all the forces.



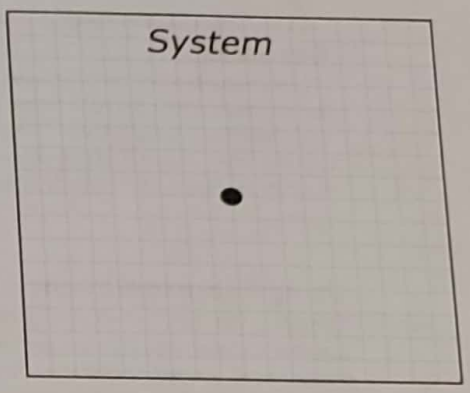
PART B: The dot to the right represents Sphere B. Draw a free-body diagram showing and labeling the electric forces only (not components) exerted on Sphere B from the other two spheres. Draw the relative lengths of all vectors to reflect the relative magnitudes of all the forces.



PART C: The dot to the right represents Sphere C. Draw a free-body diagram showing and labeling the electric forces only (not components) exerted on Sphere C from the other two spheres. Draw the relative lengths of all vectors to reflect the relative magnitudes of all the forces.



PART D: The dot to the right represents the system of the three spheres, support rods, and cart. Draw a free-body diagram showing and labeling the net electric forces only (not components) exerted on the system. Draw the relative lengths of all vectors to reflect the relative magnitudes of all the forces.



The forces that each sphere exerts on itself are internal forces, so they don't affect the system. since no external forces act on the system as well, there is no net external force acting on the system.

Argumentation

PART E: If released from rest, will the cart accelerate to the left, right, or remain at rest. Explain in a clear, coherent, paragraph-length response.

_____ Accelerate left _____ Accelerate right X Remain at rest

Since there are no net forces (forces of charges are internal) acting on the system, once the cart is released, it will not move and thus remains at rest.

The internal charges are Newton's 3rd Law pairs and the vertical forces cancel out.

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