

Physical Science

In Physical Science Module 12, study guide question 4, how do you get an increase by a factor of 8?

This is like the gravity problems you did in Module 11. The electrical force depends directly on the charge involved. Whatever you multiply or divide the charge by, the force must be multiplied or divided by the same number. The force is also inversely related to the square of the distance. If you multiply the distance by 4, you must divide the force by 4 squared, or 16.

So... let's look at this problem. First, we double the charge. That means we multiply the charge by 2. Thus, we must also multiply the force by 2. The second charge is the same. Thus nothing happens to the force as a result of that. In the end, then, the change in charges resulted in the force being multiplied by 2.

Now let's look at distance. Remember, whatever we do to distance, we do the OPPOSITE to the force, and we also square it. The distance goes from 10 cm to 5 cm. What did we do to the distance? We DIVIDED by 2. If we DIVIDED the distance by 2, we MULTIPLY the force by 2 squared, which is 4.

So... what happened? The force got multiplied by 2 when we played with the charge, and it got multiplied by 4 when we played with the distance. Thus, the overall effect is to multiply by 2 and then multiply by 4, which is the same as multiplying by 8. The new force, then, is 8 times the old force.

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Author: Jeff

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