

Unit 5C
Coulomb's Law
Note-Taking Guide TEACHER

Main Ideas, Key Points, Questions:

After watching the video segment, write down key points, main ideas, and big questions.

Objective(s):

- *Define Coulomb's law and compare it to the gravitational force.*
- *Understand electric fields as mediators of electric force.*

Notes:

During the video segment, use words, phrases, or drawings to take notes.

Summary:

After watching the video segment, write at least three sentences explaining what you learned. You may ask yourself: "If I was going to explain this to someone else, what would I say?"

Answer the following.

1. Coulomb's law describes a force that can both attract and repel. In the cases below, which way would the electric force act? Circle ATTRACT, REPEL, or NEITHER as your answer:

- | | | | |
|----|--------------------------------------|---------------------------------------|----------------------------------|
| a. | $q_1 = 4.2 \times 10^{-8} \text{ C}$ | $q_2 = -1.1 \text{ nC}$ | ATTRACT / REPEL / NEITHER |
| b. | $q_1 = 3 \text{ mC}$ | $q_2 = 7.6 \times 10^{-2} \text{ C}$ | ATTRACT / REPEL / NEITHER |
| c. | $q_1 = -8 \times 10^{-37} \text{ C}$ | $q_2 = 7.2 \text{ C}$ | ATTRACT / REPEL / NEITHER |
| d. | $q_1 = 4 \text{ nC}$ | $q_2 = -4 \text{ nC}$ | ATTRACT / REPEL / NEITHER |
| e. | $q_1 = 0 \text{ C}$ | $q_2 = 6.7 \times 10^{-15} \text{ C}$ | ATTRACT / REPEL / NEITHER |

2. What is an electric charge?

*An electric charge is a physical property of matter that causes
an object to experience electric force within an electric field.*

3. What is an electric field?

*An electric field is an invisible environment created by electric
charge that mediates the force between charged particles.*

4. Explain Coulomb's law.

*Coulomb's law states that the magnitude of the electric force between two charged particles
equals the electric constant (k) times the magnitude of the first charge times the magnitude
of the second charge, all divided by the square of the distance between the charges.*

5. If the distance between two charges is doubled, what will happen to the force between the charges?

*Since the electric force between particles depends on one over the square of the distance
between them, when that distance is doubled, the force will decrease by a factor of four.*

6. If one of the charges is doubled, what will happen to the force between the charges?

The electric force between the charges will double if one of the charges is doubled.

Answer the following.

7. Coulomb's law tells us about electric force magnitude. How do we determine force direction?

Electric force direction between two charged particles is always along the straight line connecting the particles. The polarity of the charges determines whether the force between them is attractive or repulsive. If they have opposite charges, the force vector arrows on each charge will point toward each other. If they have similar charges, the force vector arrows will point away from each other.

8. Is there ever a situation where one of the two charges interacting via Coulomb's law experiences a different force magnitude than the other charge? Why or why not?

*No. Newton's third law explains that the force of q_1 on q_2 is equal and opposite to the force of q_2 on q_1 .
The two charges push or pull on each other equally.*