What is Coulomb's Law?

Worksheet

Coulomb's law states that the force between two point charges is F = kqq/r, where k 8.99 10 Nm/C is Coulomb's constant, q and q are the charges, and r is the distance between them.

$$F = k\frac{q_1 q_2}{r^2}$$

Questions

1. Coulomb's law formula is:

A) F = mg
B) F = k qq / r
C) F = qE
D) F = ma

2. If the distance between two charges triples, the force becomes:

A) 3 larger
B) 3 smaller
C) 9 smaller
D) 9 larger

3. Two charges of the same sign will:

A) Attract
B) Repel
C) Have zero force
D) Neutralize each other

4. What is the approximate value of Coulomb's constant k?

A) 9.8 m/s
B) 6.6710 Nm/kg
C) 8.9910 Nm/C
D) 1.610 C

5. Two charges of +2 C and +3 C are 0.5 m apart. Find the force between them.

6. A charge of 5 C and a charge of 5 C repel with a force of 0.05 N. Find their separation.

7. If the distance between two fixed charges is doubled, what happens to the force?

8. Define: State Coulomb's law.

9. Define: What is Coulomb's constant?

10. Define: Is Coulomb's law an inverse-square law?

Answer Key

1. B) F = k qq / r - Coulomb's law: F = k qq / r.
2. C) 9 smaller - F 1/r, so tripling r divides F by 9.
3. B) Repel - Like charges repel each other.
4. C) 8.9910 Nm/C - k 8.99 10 Nm/C.
5. F = k q q / r F = (8.9910)(210)(310) / (0.5) F = (8.9910)(610) / 0.25 F = 0.0539 / 0.25 0.216 N
6. F = k q q / r r = k q q / F r = (8.9910)(510)(510) / 0.05 r = 0.22475 / 0.05 = 4.495 r 2.12 m
7. F 1/r Doubling r F_new = F_old / 2 = F_old / 4 The force drops to one-quarter of its original value
8. F = k qq / r - the electric force between two point charges is proportional to the product of the charges and inversely proportional to the square of the distance.
9. k 8.99 10 Nm/C, sometimes written as 1/(4).
10. Yes - force falls off as 1/r, just like gravity.