

Coulomb's Law (Electric Force)

$$F_E = \frac{k q_1 q_2}{d^2}$$

electric force (units: N)

Coulomb's constant $8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$

charges (units: C)

distance between q_1 and q_2 (units: m)

Relationship

$d \uparrow, F_E \downarrow$ (b)

F_E proportional (c)
to $\frac{1}{d^2}$



$$F_{E1} = \frac{k(+q)(-q)}{d^2}$$

A diagram showing two charges, $+q$ and $-q$, represented as circles. A horizontal line connects them, with a double-headed arrow above the line labeled $2d$, indicating the distance between the charges.

$$F_{E2} = \frac{k(+q)(-q)}{(2d)^2} = \frac{k(+q)(-q)}{4d^2}$$

$$F_{E2} = \frac{1}{4} F_{E1}$$



$$F_{E_1} = \frac{K(+q)(+q)}{d^2}$$



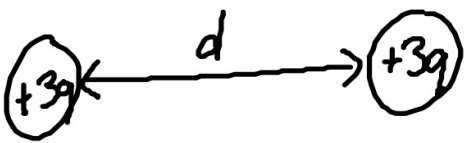
$$F_{E_2} = \frac{K(+2q)(+2q)}{d^2} = \frac{4K(+q)(+q)}{d^2}$$

$$F_{E_2} = 4F_{E_1}$$

$F_E \uparrow, q \uparrow$

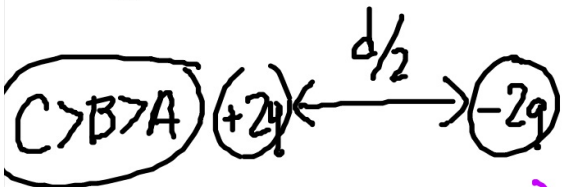


A attractive $F_E = \frac{K(-4q)(+2q)}{d^2}$



B repulsive

$$F_E = \frac{-8Kq^2}{d^2} \quad A$$



C attractive

$$F_E = \frac{K(+2q)(-2q)}{(d/2)^2}$$

$$F_E = \frac{K(+2q)(-2q)}{(d/2)^2} = \frac{-4Kq^2}{\frac{d^2}{4}}$$

$$F_E = \frac{9Kq^2}{d^2} \quad B$$

$$F_E = \frac{-16Kq^2}{d^2}$$