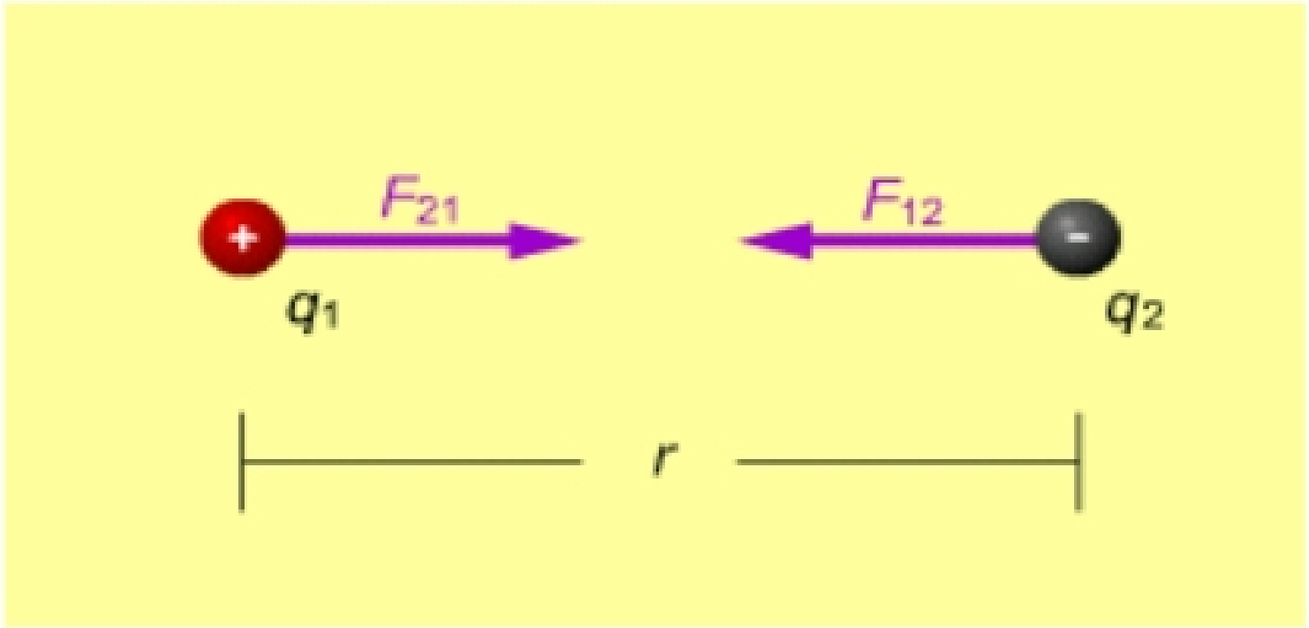
- Coulomb's Law of two point charges:



Force is a vector.
The direction of the Coulomb force follows
1. The line defined by the two point charges.
2. Like charges repel, unlike charges attract.

A reminder of Newton's gravitational force here.

Coulomb's law: The electrostatic force a charged particle exerts on another is proportional to the product of the charges and inversely proportional to the square of the distance between them.

- Coulomb's Law of two point charges:

Coulomb's law

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

F = force

k = Coulomb's constant

q = charge

r = distance between charges

Constant $k = 8.99\times10^9\ \mathrm{N\cdot m^2/C^2}$

$$k = \frac{1}{4\pi\varepsilon_0}$$

Coulomb's law, permittivity constant

$$F = \frac{1}{4\pi\varepsilon_0}\frac{|q_1||q_2|}{r^2}$$

ε_0 = permittivity constant

Constant $\varepsilon_0 = 8.85\times10^{-12}\ \mathrm{C^2/N\cdot m^2}$

Force is a vector.
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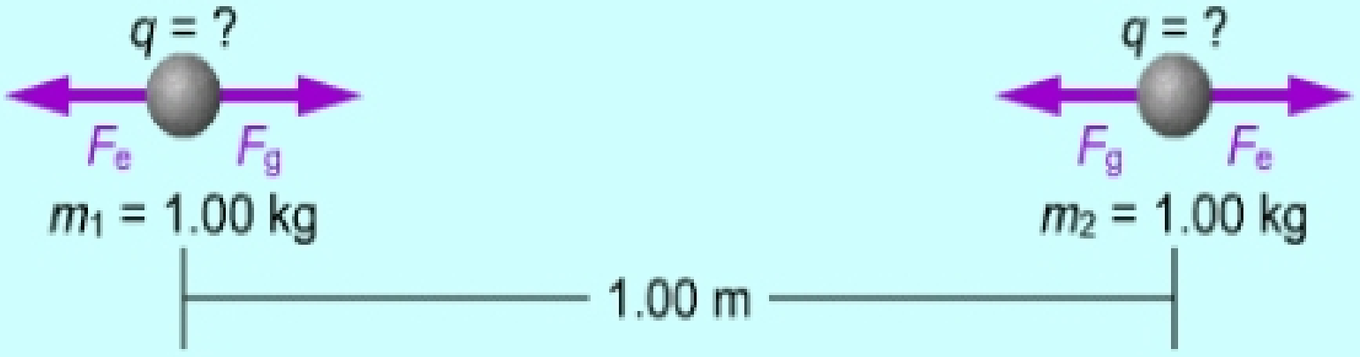
- Example 1 of using Coulomb's Law.



How many excess electrons must be added to each neutral lead sphere to balance the force of gravity between them?

gravitational constant

$G = 6.67 \times 10^{-11}\ \mathrm{N \cdot m^2/kg^2}$

1. Formula to use: $F_e = k\frac{|q_1| \cdot |q_2|}{r^2}$, $F_G = G\frac{m_1 \cdot m_2}{r^2}$

2. Condition: $F_e = F_G$

So $k\frac{|q_1| \cdot |q_2|}{r^2} = G\frac{m_1 \cdot m_2}{r^2}$

3. known: $q = q_1 = q_2$, $m = m_1 = m_2 = 1.00\ kg$.

$r = 1.00\ m$