Coulomb's law

Is an equation describing the attraction between 2 charged objects.

Coulomb found the attraction between 2 objects depends on 2 things:

1- the charge of the object

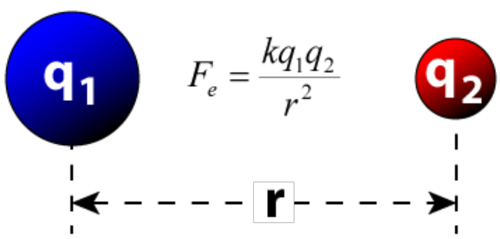
2- The distance between the 2 charged objects.

- The stronger the charge the stronger the attraction will be, the greater the distance the weaker the attraction is.

Formula: $Fe=\frac{kq1kq2}{r^2}$

Symbol	Stands for	Unit
K	Coulomb's constant = $9x10^9$	Nm^2/C^2
q_1	Charge of 1st item	C
q_2	Charge of 2nd item	C
r^2	Distance between both objects	m^2
Fe	Electrical force of objects	N

- q_1 and q_2 will be the same number unless specified in the problem.
- r often given in cm, must convert to m. ÷ 100



ex- 1

$q_1 = 4\times10^{-7}$ C and r = 3 cm

$F_e = \frac{k q_1 q_2}{r^2}$ ÷100

$$Fe = \frac{9\times10^{9}\ N m^2/C^2 \times 4\times10^{-7} C \times 4\times10^{-7} C}{(0.03\ m)^2} = 1.6N = 2N$$

ex- 2

Two positively charged objects each have a charge of 5.0×10^{-8} C and are placed 1.0 cm apart. What is the electrical force between the 2 objects?

$$Fe = \frac{9\times10^{9} \times 5.0\times10^{-8} \times 5.0\times10^{-8}}{(0.010^2)} = 0.225N$$

0.23N

ex- 3

Two positively charged particles at rest exert a force of 5.6 x 10^3 N on one another. The charge of the first particle is 6.0 x 10^{-5} C and the charge of the second particle is 2.0 x 10^{-4} C. What is the distance between the two charged particles?

$$(5.6\times10^{3}\ N) = \frac{9\times10^{9}\ Nm^2/C^2 \times 6.0\times10^{-5} C \times 2.0\times10^{-4} C}{?} =$$

$\sqrt{0.01928571 4} = .13887215$

$= 0.14m$

ex- 4

Two positively charged particles at rest exert a force of 4.65 x 10^4 N on one another. The charge of the first particle is 7 x 10^{-5} C and the charge of the second particle is 5.55 x 10^{-6} C. What is the distance between the two charged particles?

$$(4.65\times10^{4}) = \frac{9\times10^{9} \times 7\times10^{-5} \times 5.55\times10^{-6}}{?\ r^2} = 0.009m$$

ex- 5

What is the charge of sphere 2, if sphere 1 has a charge of 5×10^{-4} C the distance between both is 0.004 m and the electrical force acting between both spheres is 4×10^{4} N?

$$4\times10^{4} N = \frac{(9\times10^{9}\ Nm^2/C^2 \times 5\times10^{-4} C \times ?)}{(.004\ m^2)}$$

0.000000142

0.0000001 C

1×10^{-7} C

ex- 6

What is the charge of a sphere , if one of the spheres has a charge of 9.99×10^{-3} C the distance between both is 1.75 cm and the electrical force acting between both spheres is 4.855×10^{7} N?

$$4.855\times10^{7} = \frac{9\times10^{9} \times 9.99\times10^{-3} \times ?}{(0.0175\ m^2}$$

.000165 C

1.65×10^{-4} C