

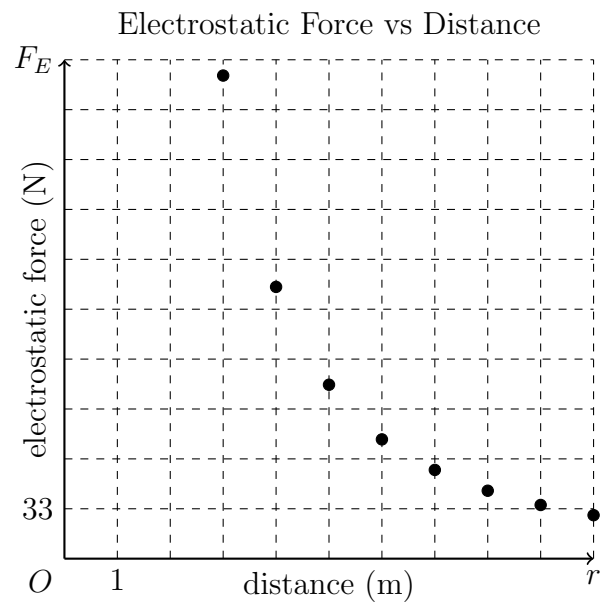
Coulomb's Law Lab

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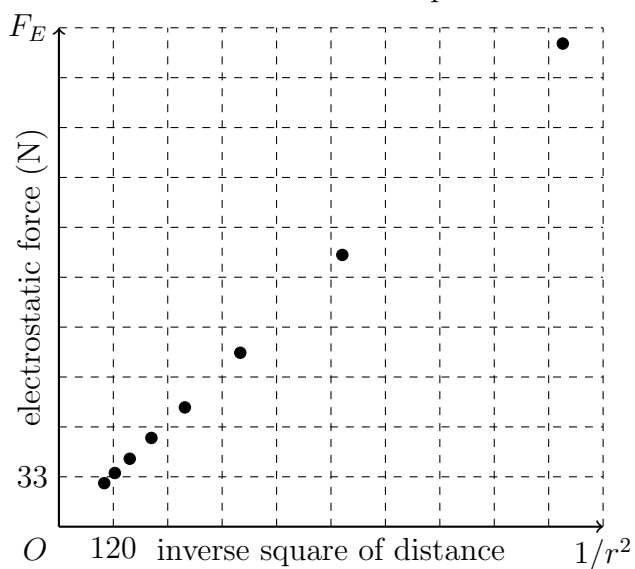
Table 1			
$q_1 = -4 \mu\text{C}$		$q_2 = 8 \mu\text{C}$	
$r \text{ (cm)}$	$r^2 \text{ (m}^2\text{)}$	$1/r^2 \text{ (m}^{-2}\text{)}$	$F_E \text{ (N)}$
10	0.01	100	28.76
9	0.0081	≈ 123.457	35.506
8	0.0064	156.25	44.938
7	0.0049	≈ 204.082	58.694
6	0.0036	277.7	78.889
5	0.0025	400	115.041
4	0.0016	625	179.751
3	0.0009	1111.1	319.557

Table 2	
$q_1 = 5 \mu\text{C}$	$r = 6 \text{ cm}$
$q_2 (\mu\text{C})$	$F_E \text{ (N)}$
10	124.827
9	112.344
8	99.862
7	87.379
6	74.896
5	62.414
4	49.931
3	36.448



The graph appears to be decaying exponentially.

Electrostatic force vs Inverse Square of Distance

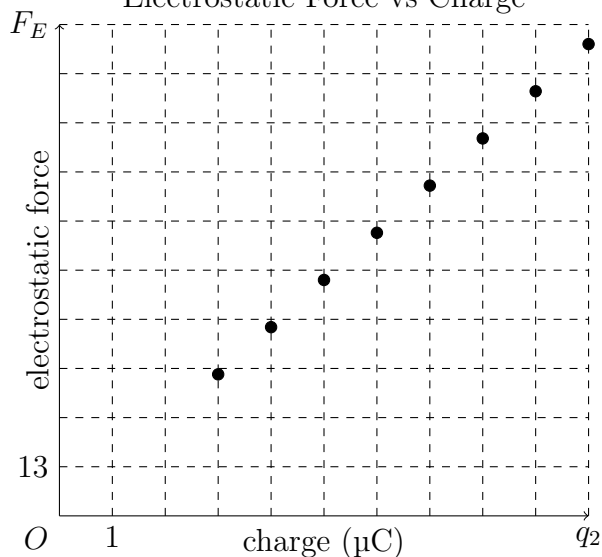


The graph appears to be linear with a positive slope.

$$F_E = k \frac{|q_1||q_2|}{r^2} = \frac{\text{slope}}{r^2} \approx \Rightarrow k = \frac{\text{slope}}{|q_1||q_2|} \approx \frac{0.2887}{|-4 \times 10^{-6}||8 \times 10^{-6}|} \approx 9.022 \times 10^9$$

$$\text{error} = \left| \frac{k - k_{\text{known}}}{k_{\text{known}}} \right| \approx 0.377\%$$

Electrostatic Force vs Charge



The graph appears to be linear with a positive slope.

$$F_E = k \frac{|q_1||q_2|}{r^2} = \text{slope} \times 10^6 \times |q_2| \Rightarrow k = \frac{\text{slope} \times 10^6 \times r^2}{|q_1|} \approx \frac{12.483 \times 10^6 \times 0.06^2}{|5 \times 10^{-6}|} \approx 8.988 \times 10^9$$

$$\text{error} = \left| \frac{k - k_{\text{known}}}{k_{\text{known}}} \right| \approx 0.003\%$$