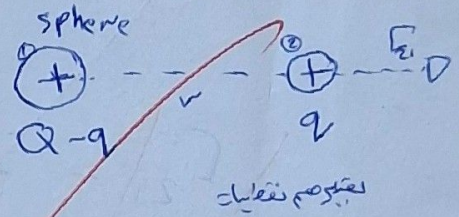
Q1: Of the charge Q initially on a tiny sphere, a portion q is to be transferred to a second, nearby sphere. Both spheres can be treated as particles and are fixed with a certain separation. For what value of q/Q will the electrostatic force between the two spheres be maximized ?



$$F = \frac{K\,|Q-q|\,|q|}{r^2}$$

$$\vec{F} = \frac{K}{r^2}(Q-q)(q)$$

$$\vec{F} = \frac{K}{r^2}\,Qq - q^2$$

* لكي يكون F_{max} نشتق ونساوي بالصفر :-

$$0 = \frac{K}{r^2}\,Q - 2q$$

$$0 = Q - 2q$$

$$2q = Q$$

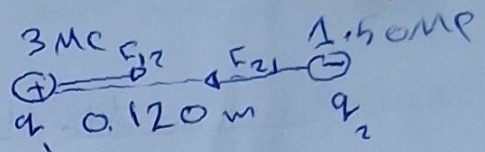
$$\frac{2q}{2} = \frac{Q}{2}$$

$$\frac{q}{Q} = \frac{Q}{2}\cdot\frac{1}{Q}$$

$$\frac{q}{Q} = \frac{1}{2}$$

Q2 : A particle of charge 3.00 μC is separated by 0.120 m from a particle of charge $-1.50\ \mu$C. (a) What is the magnitude of the electrostatic force between them? (b) What must their separation be to reduce that force by an order of magnitude?

($k = 9 \times 10^9$ N.m/c^2)



(a) $|F_{12}| = |F_{21}| = |F|$

$$F_{12} = \frac{k\,|q_1||q_2|}{r^2} = \frac{9 \times 10^9 \times 3 \times 10^{-6} \times 1.5 \times 10^{-6}}{(.120)^2}$$

$$= 2.8125\ N$$

$$|F_{21}| = +2.8125\ N$$

(b) $= 0.2_{\leq}81\ N$