$\boxed{13/04/2018}$

1) $$F = k \cdot \frac{e^2}{d^2} \qquad (e = -1{,}6 \cdot 10^{-19}\,C)$$

$$d = \sqrt{\frac{K \cdot e^2}{F}} = \boxed{8 \cdot 10^{-9}\,m}$$

2) $$F = k \cdot \frac{q^2}{d^2} \longrightarrow q = \sqrt{\frac{F \cdot d^2}{k}} = \boxed{1{,}6 \cdot 10^{-12}\,C}$$

3) $\dot{A}$ $\dot{B}$ $\dot{C}$ $\boxed{x_C > 10\,cm}$ N.B.

IN C VI È UNA CARICA NEGATIVA $-Q$.

$$|\vec{E}_A| = \frac{k \cdot Q}{(x_C - x_A)^2} \; ; \; |\vec{E}_B| = \frac{k \cdot Q}{(x_C - x_B)^2}$$

$$\begin{cases} k \cdot Q = |\vec{E}_A| \cdot (x_C - x_A)^2 \\ k \cdot Q = |\vec{E}_B| \cdot (x_C - x_B)^2 \end{cases}$$

$$(x_C - x_A)^2 \cdot 10 = (x_C - x_B)^2 \cdot 15$$

$$\Rightarrow \dots \Rightarrow x_C = (20 \pm 5\sqrt{6})\,cm$$

È ACCETTABILE SOLO LA SOLUZIONE $x_C = (20 + 5\sqrt{6})\,cm$
$\approx \boxed{32\,cm}$

$\boxed{Q = -81\,pC}$ $(-81 \cdot 10^{-12}\,C)$

4) $$|\vec{E}| = 2 \cdot k \frac{Q_1}{\left(\sqrt{d^2+x^2}\right)^2} \cdot \frac{x}{\sqrt{d^2+x^2}}$$

$$|\vec{F}| = Q_2 \cdot |\vec{E}| = 2k \frac{Q_1 Q_2 \, x}{(d^2+x^2)^{3/2}}$$

DETERMINO IL MAX della FUNZIONE

$$f(x) = \frac{x}{(d^2+x^2)^{3/2}}$$

$$f'(x) = \frac{d^2-2x^2}{(d^2+x^2)^{5/2}}$$

MAX IN $\boxed{x^* = \frac{d}{\sqrt{2}}}$.

OPPURE POSSIAMO CALCOLARE IL MAX della FUNZIONE $g(x) = \frac{x^2}{(d^2+x^2)^3}$

$$g'(x) = \frac{2x \cdot (d^2 - 2x^2)}{(d^2+x^2)^4}$$

MAX IN $x^* = \frac{d}{\sqrt{2}}$.

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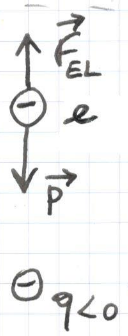
5) 

$$mg = k \cdot \frac{q \cdot e}{y^2} \Rightarrow y = \sqrt{\frac{k q e}{mg}}$$

$$\boxed{y = 3{,}2 \cdot 10^5 \, m}$$