Answer on Question #72996, Physics / Electromagnetism

Question. Determine the magnitude and direction of the electric field at a point midway between a $-8\ microC$ and a $5.8\ microC$ charge $6\ cm$ apart.

Given. $q_1 = -8\ microC;\ q_2 = 5.8\ microC;\ d = 6\ cm.$

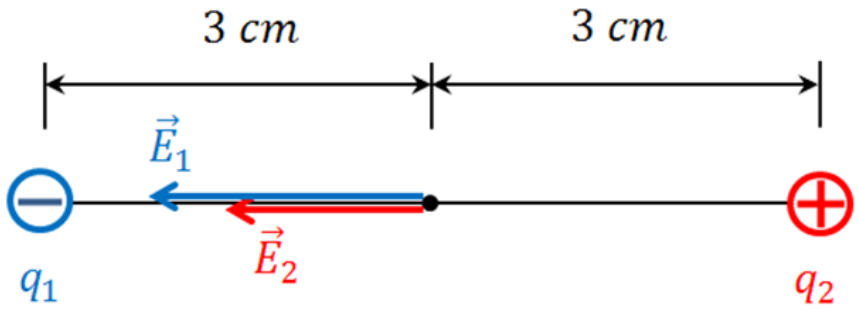
Find. $|\vec{E}| - ?$

Solution.

For a point charge

$$E = \frac{1}{4\pi\varepsilon_0}\frac{q}{x^2}.$$

For our two charges



$$\vec{E} = \vec{E}_1 + \vec{E}_2.$$

So

$$|\vec{E}_1| = \frac{1}{4\pi\varepsilon_0}\frac{|q_1|}{(d/2)^2} = \frac{1}{4\cdot 3.14\cdot 8.85\cdot 10^{-12}}\frac{8\cdot 10^{-6}}{(0.06/2)^2} = 80\cdot 10^6\ V/m$$

$$|\vec{E}_2| = \frac{1}{4\pi\varepsilon_0}\frac{|q_2|}{(d/2)^2} = \frac{1}{4\cdot 3.14\cdot 8.85\cdot 10^{-12}}\frac{5.8\cdot 10^{-6}}{(0.06/2)^2} = 58\cdot 10^6\ V/m$$

$$|\vec{E}| = |\vec{E}_1| + |\vec{E}_2| = 80\cdot 10^6 + 58\cdot 10^6 = 138\cdot 10^6\ V/m.$$

Answer. $|\vec{E}| = 138\cdot 10^6\ V/m$; the vector of the electric field is directed to the negative charge.