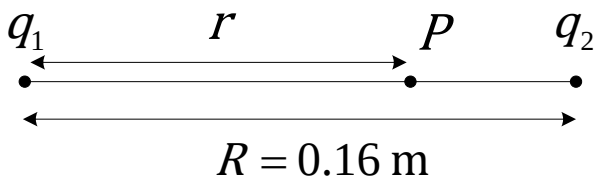
Two electric charges of 9uC and -3uC are placed 0.16m apart in air . There will be a point P at which electric potential is zero on the line joining the two charges and in between them. The distance of P from 9uC charge is ?

A) 0.14 m B) 0.12 m C) 0.08 m D) 0.06 m

Solution.



Denote: $q_1 = 9\,\mu\text{C}, q_2 = -3\,\mu\text{C}, R = 0.16$ m. Assume the distance from q_1 to P equals r. The potential of the point P equals zero ($\varphi_P = 0$) . On the other hand, according to the superposition principle this potential is:

$$\varphi_P = \varphi_1 + \varphi_2,$$

where $\varphi_1 = \dfrac{q_1}{4\pi\varepsilon_0 r}$ is the potential at the point P produced by q_1, $\varphi_2 = \dfrac{q_2}{4\pi\varepsilon_0 (R-r)}$ is the potential at the point P produced by q_2 (the distance from q_2 to P equals $R-r$) , $\varepsilon_0 = 8.85\cdot 10^{-12}$ F/m is the electric constant. So we have:

$$\varphi_P = \frac{q_1}{4\pi\varepsilon_0 r} + \frac{q_2}{4\pi\varepsilon_0 (R-r)} = 0; \quad q_1(R-r) = -q_2 r; r = \frac{q_1 R}{q_1 - q_2} = 0.12 \text{ m}.$$

Answer: B.