

Chapter 01

ELECTRIC CHARGES AND FIELDS

Example- 8:

A point charge $50\mu C$ is located at a point $(2\hat{i} + 3\hat{j})$. Find the electric field vector $\vec{E}$ at a point which position vector $(8\hat{i} - 5\hat{j})$. When the position vectors are expressed in metre.

Solution:

Given,

$$q = 50\mu C = 50 \times 10^{-6} = 5 \times 10^{-5} C$$

$$\vec{r} = (\vec{r}_2 - \vec{r}_1) = (8\hat{i} - 5\hat{j}) - (2\hat{i} + 3\hat{j})$$

$$\vec{r} = (6\hat{i} - 8\hat{j})$$

$$|\vec{r}| = r = \sqrt{6^2 + 8^2} = \sqrt{100} = 10$$

$$E = \frac{1}{4\pi\epsilon_0} \frac{q}{r^3} (\vec{r}) = \frac{9 \times 10^9 \times 5 \times 10^{-5}}{1000} \times (6\hat{i} - 8\hat{j})$$

$$\vec{E} = 450(6\hat{i} - 8\hat{j})$$

$$\boxed{\vec{E} = 900(3\hat{i} - 4\hat{j}) \text{ N/C}}$$