

Phy220 Unquiz 01

Note: $k=8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$

Consider the following charges: (1: $+2\mu\text{C}$; 2,3), (2: $-3\mu\text{C}$; 1,5). Find the force on charge 2 due to charge 1. The coordinates here are in SI units.

Steps:

Identify p charge:

$$\vec{r}_1 =$$

$$\vec{r}_2 =$$

$$\vec{r}_{ip} =$$

$$|\vec{r}_{ip}| =$$

Complete the Force:

$$\vec{F}_{p?} = k \frac{q_? q_p \vec{r}_{?p}}{|\vec{r}_{?p}|^2}$$

Find the numerical vector force with correct SI units:

$$\vec{F}_{??} = (??)\hat{x} + (??)\hat{y}?$$

Phy250 Unquiz 01

$$\text{Note: } k=8.99 \times 10^9 \frac{\text{Nm}^2}{\text{C}^2}$$

Consider the following charges: (1: $+2\mu\text{C}$; 2,3), (2: $-3\mu\text{C}$; 1,5). Find the force on charge 2 due to charge 1. The coordinates here are in SI units.

Steps:

Identify p charge: Charge 2 is charge p.

$$\vec{r}_1 = 2\hat{x} + 3\hat{y}$$

$$\vec{r}_2 = 1\hat{x} + 5\hat{y} = \vec{r}_p$$

$$\vec{r}_{ip} = \vec{r}_p - \vec{r}_i = (1-2)\hat{x} + (5-3)\hat{y} = -1\hat{x} + 2\hat{y}$$

$$|\vec{r}_{ip}| = \sqrt{(-1)^2 + 2^2} = \sqrt{5} = 2.24$$

Complete the Force:

$$\vec{F}_{ip} = k \frac{q_1 q_p \vec{r}_{ip}}{|\vec{r}_{ip}|^3}$$

Find the numerical vector force with correct SI units:

$$\begin{aligned} F &= 8990 \mu \left[\frac{-1\hat{x}}{2.24^3} + \frac{2\hat{y}}{2.24^3} \right] = 8990 \mu \left[\frac{-1}{11.2}\hat{x} + \frac{2}{11.2}\hat{y} \right] \\ &= 8990 \mu [-0.089\hat{x} + 0.179\hat{y}] = -803 \times 10^{-6}\hat{x} + 1605 \times 10^{-6}\hat{y} \\ &= 8.03 \times 10^{-4}\hat{x} + 1.605 \times 10^{-3}\hat{y} \text{ N} \end{aligned}$$

$$\vec{F}_{12} = [(8.03 \times 10^{-4})\hat{x} + (1.605 \times 10^{-3})\hat{y}] \text{ N}$$