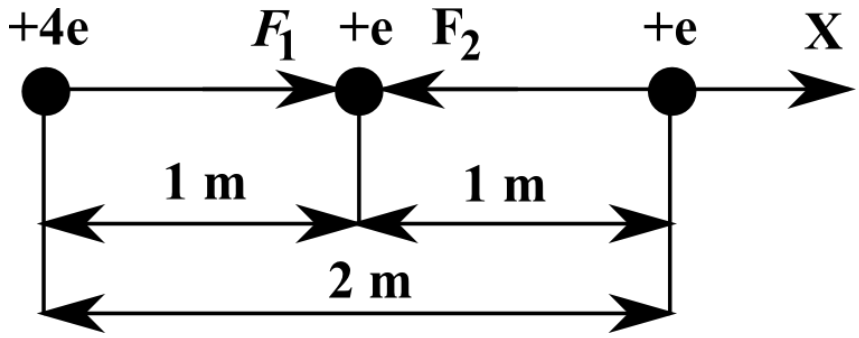
Answer on Question 70076, Physics, Electric Circuits

Question:

Two point charges $+4e$ and $+e$ are separated by a distance of $2\,m$. Determine the resultant force on a charge $+e$ placed at the mid-point of the line joining them.

Solution:



The resultant force on charge $+e$ is the vector sum of two contributions, the repulsive force due to charge $+4e$ and the repulsive force due to charge $+e$. Then, we get:

$$F_{res} = F_1 + F_2 = k\frac{q_1 q_2}{r_{12}^2} + \left(-k\frac{q_2 q_3}{r_{23}^2}\right) =$$

$$= 9 \cdot 10^9 \frac{Nm^2}{C^2}$$

$$\cdot \left[\frac{4 \cdot 1.6 \cdot 10^{-19}\,C \cdot 1.6 \cdot 10^{-19}\,C}{(1\,m)^2} - \frac{1.6 \cdot 10^{-19}\,C \cdot 1.6 \cdot 10^{-19}\,C}{(1\,m)^2}\right] =$$

$$= 6.91 \cdot 10^{-28}\,N.$$

Answer:

$F_{res} = 6.91 \cdot 10^{-28}\,N.$