

## Answer on Question 58951, Physics, Electromagnetism

### Question:

A sodium ion ( $m = 22.99 \text{ g/mol}$ ,  $q = 1.6 \cdot 10^{-19} \text{ C}$ ) in the crystal structure of table salt lies  $0.236 \text{ nm}$  from a chloride ion ( $m = 35.45 \text{ g/mol}$ ,  $q = -1.6 \cdot 10^{-19} \text{ C}$ ). Find the mutual force between the ions.

### Solution:

We can find the electric force (mutual force) between the ions from the Coulomb's law:

$$F_e = k \frac{|q_1 q_2|}{r^2},$$

here,  $q_1 = 1.6 \cdot 10^{-19} \text{ C}$  is the charge of the sodium ion,  $q_2 = -1.6 \cdot 10^{-19} \text{ C}$  is the charge of the chloride ion,  $r$  is the distance between two ions,  $k$  is the Coulomb's constant.

Let's substitute the numbers:

$$\begin{aligned} F_e &= k \frac{|q_1 q_2|}{r^2} = 9 \cdot 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2} \cdot \frac{|(1.6 \cdot 10^{-19} \text{ C}) \cdot (-1.6 \cdot 10^{-19} \text{ C})|}{(0.236 \cdot 10^{-9} \text{ m})^2} = \\ &= 4.14 \cdot 10^{-9} \text{ N}. \end{aligned}$$

### Answer:

$$F_e = 4.14 \cdot 10^{-9} \text{ N}.$$