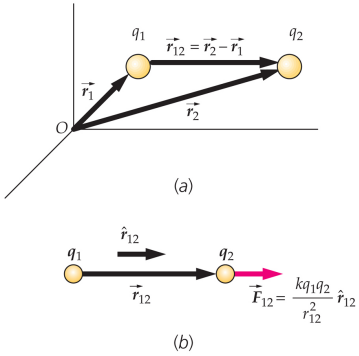
Coulomb's Law (2)

Coulomb's law for electrostatic force in vector form

$$\vec{F}_{12} = k\,\frac{q_1 q_2}{r_{12}^2}\,\hat{r}_{12},$$

$$\vec{r}_{12} \doteq \vec{r}_2 - \vec{r}_1, \quad \hat{r}_{12} \doteq \frac{\vec{r}_{12}}{r_{12}}.$$

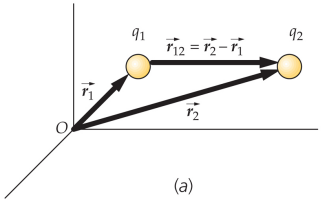


Coulomb's Law (2)

Coulomb's law for electrostatic force in vector form

$$\vec{F}_{12} = k\,\frac{q_1 q_2}{r_{12}^2}\,\hat{r}_{12},$$

$$\vec{r}_{12} \doteq \vec{r}_2 - \vec{r}_1, \quad \hat{r}_{12} \doteq \frac{\vec{r}_{12}}{r_{12}}.$$

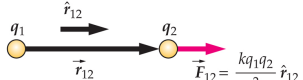


(a)

Electric force in hydrogen atom:

Average distance: $r = 5.3 \times 10^{-11}\text{m}$.
Elementary charge: $e = 1.60 \times 10^{-19}\text{C}$.

$$\begin{aligned} F &= k\,\frac{|q_1 q_2|}{r^2} \\ &= \frac{(8.99 \times 10^9 \text{Nm}^2/\text{C}^2)(1.60 \times 10^{-19}\text{C})^2}{(5.3 \times 10^{-11}\text{m})^2} \\ &= 8.2 \times 10^{-8}\text{N}. \end{aligned}$$



(b)