Example T5.3

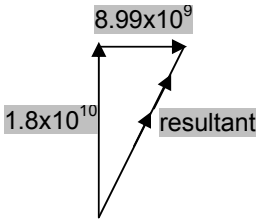
Force on +2nC charge due to –2nC charge:

$$F = \frac{8.99\times10^{9}(2\times2\times10^{-9})\times(-2\times10^{-9})}{(2\times10^{-9})^{2}} = -8.99\times10^{9}\,N$$ (attractive – to right)

Force on +2nC charge due to +1nC charge:

$$F = \frac{8.99\times10^{9}(2\times2\times10^{-9})\times(1\times10^{-9})}{(1\times10^{-9})^{2}} = 1.80\times10^{10}\,N$$ (repulsive - upwards)

Resultant force can be found using a vector diagram:



$$\textit{magnitude} = \sqrt{(1.80\times10^{10})^{2} + (8.99\times10^{9})^{2}}$$
$$= 2.01\times10^{10}$$

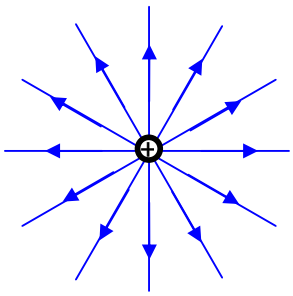
$$\text{direction} = \tan^{-1}\left(\frac{8.99\times10^{10}}{1.80\times10^{9}}\right) = 63.4°$$

Answer: The resultant force is 2×10^{10}N at an 63º right of upwards

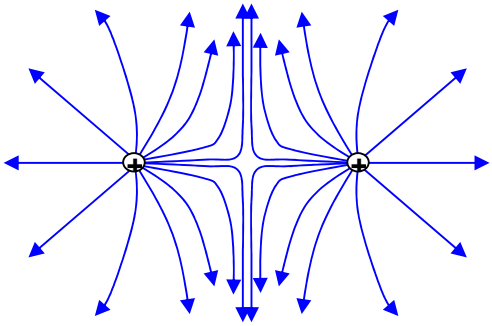
Example T5.4

$$E = \frac{F}{q} = \frac{1.92\times10^{-14}}{1.6\times10^{-19}} = 1.2\times10^{5}\,NC^{-1}$$

Example T5.5



Example T5.6



Example T5.7

$$E = k\frac{q}{r^{2}} = 8.99\times10^{9}\times\frac{1.6\times10^{-19}}{(1\times10^{-3})^{2}} = 1.4384\times10^{3}\,NC^{-1}$$

Answer $1.4\times10^{3}\,NC^{-1}$