TABLE 25–1

ELECTRIC FIELDS AND POTENTIALS FOR VARIOUS CHARGE CONFIGURATIONS

Charge Configuration	*Magnitude of Electric Field*	*Electric Potential*	*Location of Zero Potential*
Point charge	$\dfrac{q}{4\pi\epsilon_0 r^2}$	$\dfrac{q}{4\pi\epsilon_0 r}$	∞
Infinite line of uniform charge density λ	$\dfrac{\lambda}{2\pi\epsilon_0 r}$	$-\dfrac{\lambda}{2\pi\epsilon_0}\ln\dfrac{r}{a}$	$r = a$
Parallel, oppositely charged plates of uniform charge density σ, separation d	$\dfrac{\sigma}{\epsilon_0}$	$\Delta V = -Ed = -\dfrac{\sigma d}{\epsilon_0}$	Anywhere
Charged disk of radius R, along axis at distance x	$\dfrac{Q}{2\pi\epsilon_0}\left(\dfrac{\sqrt{R^2+x^2}-x}{\sqrt{R^2+x^2}}\right)$	$\dfrac{Q}{2\pi\epsilon_0 R^2}(\sqrt{R^2+x^2}-x)$	∞
Charged spherical shell of radius R	$r \geq R$: $\dfrac{Q}{4\pi\epsilon_0 r^2}$	$r > R$: $\dfrac{Q}{4\pi\epsilon_0 r}$	∞
	$r < R$: 0	$r \leq R$: $\dfrac{Q}{4\pi\epsilon_0 R}$	∞
Electric dipole	Along bisecting axis only, far away: $\dfrac{p}{4\pi\epsilon_0 r^3}$	Everywhere, far away: $\dfrac{p\cos\theta}{4\pi\epsilon_0 r^2}$	∞
Charged ring of radius R, along axis	$\dfrac{Qx}{4\pi\epsilon_0(R^2+x^2)^{3/2}}$	$\dfrac{Q}{4\pi\epsilon_0\sqrt{R^2+x^2}}$	∞
Uniformly charged nonconducting solid sphere of radius R	$r \geq R$: $\dfrac{Q}{4\pi\epsilon_0 r^2}$	$r \geq R$: $\dfrac{Q}{4\pi\epsilon_0 r}$	∞
	$r < R$: $\dfrac{Qr}{4\pi\epsilon_0 R^3}$	$r < R$: $\dfrac{Q}{8\pi\epsilon_0}\left(3-\dfrac{r^2}{R^2}\right)$	∞