$$\vec{F}_{12} = \frac{kq_1q_2}{r^2}\hat{r} \quad \text{(Coulomb's law)}$$

$$\vec{E} = \int d\vec{E} = \int \frac{k\,dq}{r^2}\hat{r} \quad \left(\begin{array}{c}\text{field of a continuous}\\ \text{charge distribution}\end{array}\right)$$

$$E = \frac{\sigma}{\epsilon_0} \quad \text{(field at conductor surface)}$$

$$E = \frac{2k\lambda}{r} \quad \text{(field of electrical line)}$$

$$\Delta V_{AB} = \frac{\Delta U_{AB}}{q} = -\int_A^B \vec{E}\cdot d\vec{r} \quad \text{(electric potential difference)}$$

$$V_{\infty r} = V(r) = \frac{kq}{r} \quad \text{(point-charge potential)}$$

$$V = \int dV = \int \frac{k\,dq}{r} \quad \left(\begin{array}{c}\text{potential of a continuous}\\ \text{charge distribution}\end{array}\right)$$

$$C = \frac{Q}{V} \quad \text{(capacitance)}$$

$$U = \tfrac{1}{2}CV^2 \quad \text{(energy in a capacitor)}$$

$$u_E = \tfrac{1}{2}\epsilon_0 E^2 \quad \text{(electric energy density)}$$

$$u_B = \frac{B^2}{2\mu_0} \quad \text{(magnetic-energy density)}$$

$$I = \frac{dQ}{dt} \quad \text{(instantaneous current)}$$

$$\vec{J} = \sigma\vec{E} \quad \text{(Ohm's law, microscopic version)}$$

$$I = \frac{V}{R} \quad \text{(Ohm's law, macroscopic version)}$$

$$P = IV \quad \text{(electric power)}$$

$$\vec{F}_B = q\vec{v}\times\vec{B} \quad \text{(magnetic force)}$$

$$\vec{F} = q\vec{E} + q\vec{v}\times\vec{B} \quad \text{(electromagnetic force)}$$

$$\vec{F} = I\vec{l}\times\vec{B} \quad \text{(magnetic force on a current)}$$

$$d\vec{B} = \frac{\mu_0}{4\pi}\frac{I d\vec{l}\times\hat{r}}{r^2} \quad \text{(Biot–Savart law)}$$

$$\vec{\mu} = NI\vec{A} \quad \left(\begin{array}{c}\text{magnetic dipole moment,}\\ N\text{-turn current loop}\end{array}\right)$$

$$\vec{S} = \frac{\vec{E}\times\vec{B}}{\mu_0} \quad \text{(Poynting vector)}$$

Gauss for $\vec{E}$	$\oint \vec{E}\cdot d\vec{A} = \frac{q}{\epsilon_0}$	How charges produce electric field; field lines begin and end on charges.	(29.2)
Gauss for $\vec{B}$	$\oint \vec{B}\cdot d\vec{A} = 0$	No magnetic charge; magnetic field lines don't begin or end.	(29.3)
Faraday	$\oint \vec{E}\cdot d\vec{r} = -\frac{d\Phi_B}{dt}$	Changing magnetic flux produces electric field.	(29.4)
Ampère	$\oint \vec{B}\cdot d\vec{r} = \mu_0 I + \mu_0\epsilon_0\frac{d\Phi_E}{dt}$	Electric current and changing electric flux produce magnetic field.	(29.5)

$$B = \mu_0 nI \quad \text{(solenoid field)} \qquad R = \frac{\rho L}{A}$$

$$\mathcal{E} = -\frac{d\Phi_B}{dt} \quad \text{(Faraday's law)}$$

$$U = \tfrac{1}{2}LI^2 \quad \text{(energy stored in inductor)}$$

$$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$$

$$\varepsilon = -L\frac{dI}{dt}$$