

Maxwell's Equation -

It is collection of 4 eqn vide Gauss law for electrostatics, magnetostatic, Faradays law & Amperes Circuital law.

Law	Integral Form	Point Form or Differential Form
1) Gauss Law for electrostatic	$\oint_S \vec{D} \cdot d\vec{S} = Q_{encl.}$	$\nabla \cdot \vec{D} = \rho_v$ $\xrightarrow{\text{Div. Theorem}} Q = \int \rho_v dV$
2) Amperes Circuital Law Modified Amperes Circuital.	$\oint_L \vec{H} \cdot d\vec{l} = I_{encl.}$	$\nabla \times \vec{H} = \vec{J}$ $\xrightarrow{\text{Stokes Theorem}} \vec{I} = \int \vec{J} \cdot d\vec{s}$
3) Faraday Law of Electro magnetic Induction	$\int_L \vec{E} \cdot d\vec{l} = - \int_S \frac{\partial \vec{B}}{\partial t} \cdot d\vec{s}$	$\nabla \times \vec{E} = - \frac{\partial \vec{B}}{\partial t}$
4) Gauss law for Magnetic - static	$\oint_S \vec{B} \cdot d\vec{l} = 0$	$\nabla \cdot \vec{B} = 0$

- ① $Q \rightarrow$ stationary \rightarrow Electrostatic field
- ② $Q \rightarrow$ moving (uniform velocity) \rightarrow Magnetostatic field
- ③ $Q \rightarrow$ moving (accelerated velocity) \rightarrow Electromagnetic wave field

Interpretation

static charge will produce electric field density (\vec{D}) (Electrostatic)

moving charge with uniform speed (velocity) produce magnetic field intensity (\vec{H}) (magnetostatic)

Time varying B/E produces E/B respectively.

No isolated magnetic pole can exist