

ELECTROMAGNETISM REVISION NOTES:

1 Coulomb's Law

The electrostatic potential, $V(\mathbf{r})$, at a point $\mathbf{r}$ due to a point charge q at the origin is given by

$$V(\mathbf{r}) = \frac{q}{4\pi\epsilon_0|\mathbf{r}|}.$$

The corresponding electric field, (vector quantity) is given by

$$\mathbf{E} = \frac{q}{4\pi\epsilon_0|\mathbf{r}|^2}\hat{\mathbf{r}}$$

This means that the electrostatic *potential energy* of a point charge q' at the point $\mathbf{r}$ is

$$U = \frac{q q'}{4\pi\epsilon_0|\mathbf{r}|},$$

and the force (vector quantity) acting on it is

$$\mathbf{F} = \frac{q q'}{4\pi\epsilon_0|\mathbf{r}|^2}\hat{\mathbf{r}}$$

2 Magnetic Moments:

The magnetic moment of a particle of mass m , electric charge q and angular momentum $\mathbf{L}$ is

$$\underline{\mu} = \frac{q}{2m}\mathbf{L}.$$

3 Charged Particle in a Magnetic Field

The force, $\mathbf{F}$ acting on a particle of charge q moving with velocity $\mathbf{v}$ in a magnetic field $\mathbf{B}$ is

$$\mathbf{F} = q \mathbf{v} \times \mathbf{B}$$