Class 12 - Important Formulas

Chapter 4 - Moving Charges and Magnetism

S.No.	Term	Description
1	**Biot-Savart law**	Magnetic fiels dB at any point whose position vector is **r** wrt current elemant d**l** is given by $d\boldsymbol{B} = \frac{\mu_0 I}{4\pi}\frac{(d\boldsymbol{l} \times \boldsymbol{r})}{r^3}$
2	**Magnetic field due to long current carrying conductor**	$B = \frac{\mu_0 2I}{4\pi r}$
3	**Magnetic field at centre of a circular loop**	$B = \frac{\mu_0 I}{2r}$
4	**Magnetic field at centre of coil of n turns**	$B = \frac{\mu_0 In}{2r}$
5	**Magnetic field on the axis of a circular loop**	$B = \frac{\mu_0 Ir^2}{2(r^2 + x^2)^{3/2}}$ if there are n turns in the coil then $B = \frac{\mu_0 Inr^2}{2(r^2 + x^2)^{3/2}}$
6	**Ampere's circuital law**	$\oint \boldsymbol{B} \cdot d\boldsymbol{l} = \mu_0 I$
7	**Field due to toroidal solenoid**	$B = \mu_0 nI$
8	**Field inside straight solenoid**	$B = \mu_0 nI$ and direction of field is parallel to the axis of solenoid
9	**Force on moving charge in magnetic field**	$\boldsymbol{F} = q(\boldsymbol{v} \times \boldsymbol{B})$ Direction of force is perpendicular to both ***v*** and ***B***
10	**Force on current carrying conductor in the magnetic field**	$\boldsymbol{F} = I(\boldsymbol{l} \times \boldsymbol{B})$ where l is the length of the conductor in the direction of current in it
11	**Force between two parallel wires carrying current**	$F = \frac{\mu_0 I_1 I_2}{2\pi R}$
12	**Torque on a current carrying loop**	$\boldsymbol{\tau} = (\boldsymbol{m} \times \boldsymbol{B})$ Where ***m*** is the magnetic moment of the dipole and magnitude of magnetic moment is m=NIB where A is the area of the loop and N is the number of turns in the loop.
13	**Lorentz force**	Force on electron moving with velocity ***v*** in presence of both uniform electric and magnetic field is $\boldsymbol{F} = -e(\boldsymbol{E} + \boldsymbol{v} \times \boldsymbol{B})$
14	**Magnetic dipole moment of bar magnet**	**m=**q(2**a**) where q is the pole strength and (2**a**) is the length of the bar magnet. It is the vector pointing from south to north pole of the magnet.
15	**torque on the bar magnet**	$\boldsymbol{\tau} = \boldsymbol{m} \times \boldsymbol{B}$
16	**Potential energy of a magnetic dipole**	U=-mBcosθ