Magnetic Forces and Magnetic Fields

Magnetic Fields:

⇒ all magnets have both a north pole and a south pole

⇒ like poles repel, opposite poles attract

⇒ a magnetic field surrounds every magnet or moving electric charge (magnetic field points from north to south pole)

Force on a Charge Moving in a Magnetic Field:

⇒ magnitude is given by $F = |q| vB \sin\theta$

⇒ direction is given by ***RHR1***: point fingers of right hand along $\vec{B}$ and thumb along $\vec{v}$; your palm points in the direction of $\vec{F}$ on a positive charge

⇒ a charge moving in a magnetic field will travel in a circular path of radius: $r = \dfrac{mv}{|q|B}$

Current Carrying Wire:

⇒ the force on a current carrying wire in a magnetic field is give by: $F = ILB \sin\theta$

⇒ the magnetic field a distance r away from a long-straight wire is given by: $B = \dfrac{\mu_0 I}{2\pi r}$

$$\mu_0 = 4\pi \times 10^{-7} \ {}^{Tm}\!/_{A}$$

direction is given by ***RHR2***: point thumb in the direction of conventional current; your fingers curl in the direction of the magnetic field

Loop of Wire:

⇒ the magnetic field at the center of a circular loop of wire is given by: $B = N\dfrac{\mu_0 I}{2R}$

⇒ the direction of the magnetic field inside a coil or loop of wire is given by RHR3

RHR3: curl the fingers of your right hand in the direction of conventional current; your thumb points in the direction of $\vec{B}$ (within the loop)