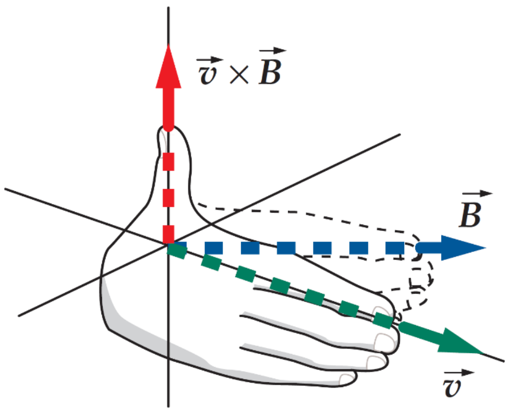
Magnetic Field 磁场

Magnetic Force on a Moving Charged Particle(移动电荷受到的磁力)

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

单位 T

Right-hand rule 右手定则

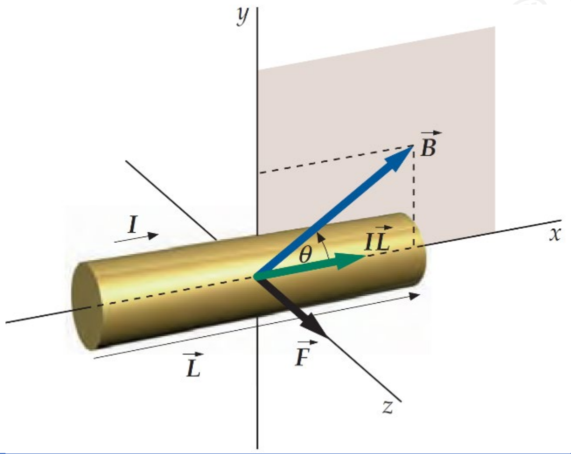


Magnetic Force on a straight segment of current-carrying wire

$$\left.\begin{aligned}\vec{F} &= (q\vec{v} \times \vec{B})nAL \\ I &= nqvA\end{aligned}\right\} \Rightarrow$$

Straight Line: $\vec{F} = I\vec{L} \times \vec{B}$

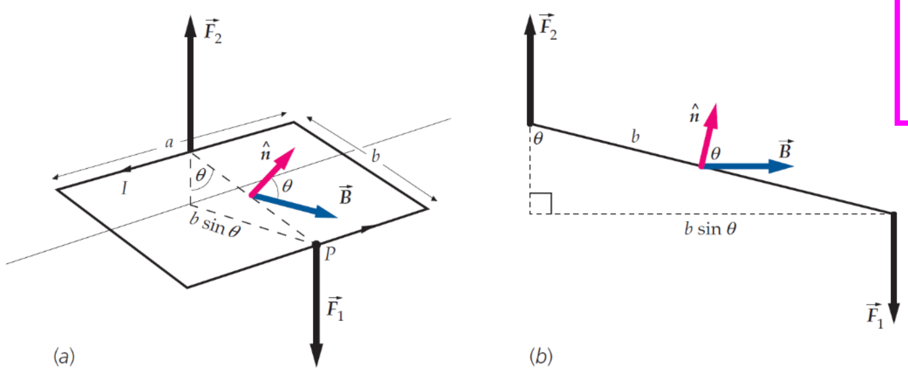
Current segment: $d\vec{F} = Id\vec{l} \times \vec{B}$



Current loop

Magnetic Dipole Moment(磁偶极矩) $\vec{\mu} = NIA\hat{n}$ $A: area$

Torque on a current loop(电流环力矩) $\vec{\tau} = \vec{\mu} \times \vec{B}$



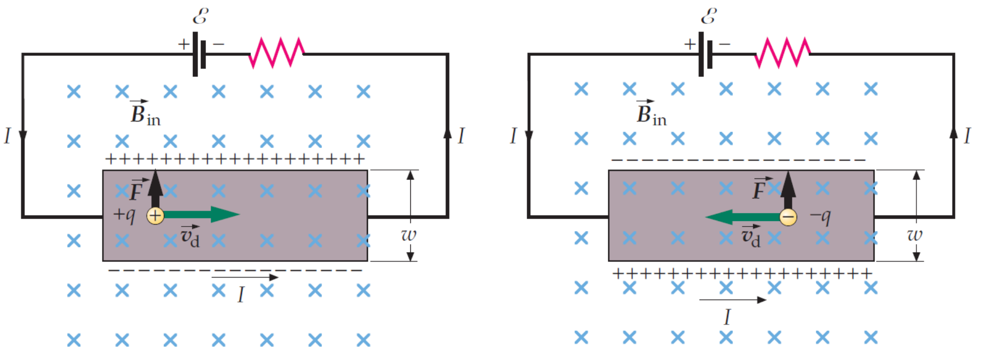
注意区分
1.力的方向
2.力矩的方向

Potential Energy of a magnetic dipole in a magnetic field

$$U = -\vec{\mu} \cdot \vec{B} = -\mu B \cos\theta$$

Hall Effect 霍尔效应

Hall Effect 电流通过垂直方向的磁场时产生横向电荷累积的现象



需要：掌握电荷累积的方向。

Hall Voltage

$$V_H = E_H w = v_d B w = \frac{|I|}{nte}$$

E_H: 感生电场强度
w: (电流的)宽度
v_d: 电荷移动速度
B: 磁感应强度
t: (电流的)厚度

目录