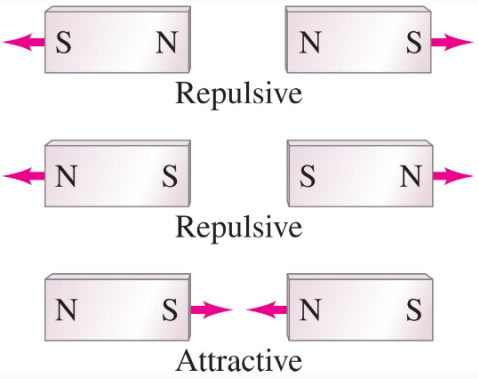
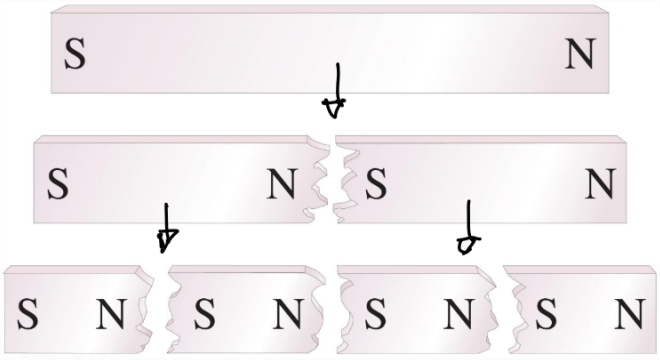
# Chapter 27: Magnetism

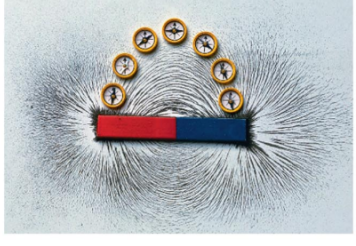
## Magnets and magnetic field:

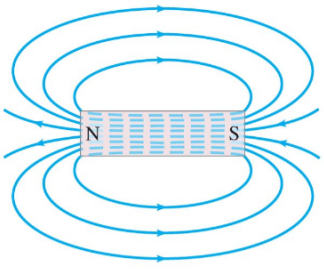



* Like poles repel each other, unlike poles attract each other.
* There is no isolated south or north pole, i.e., there is no magnetic monopole.

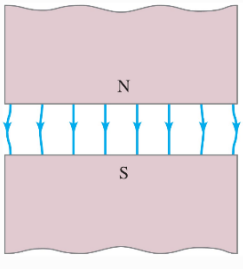
## Magnetic field lines:





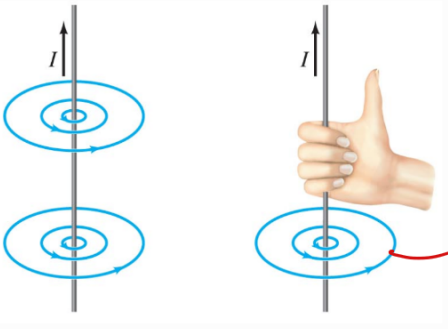

* magnetic field lines are always closed loops!

## Uniform magnetic fields:



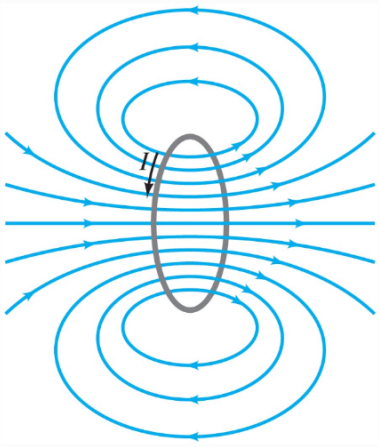

* A uniform magnetic field is constant both in magnitude and direction!

## Magnetic fields created by electric currents:

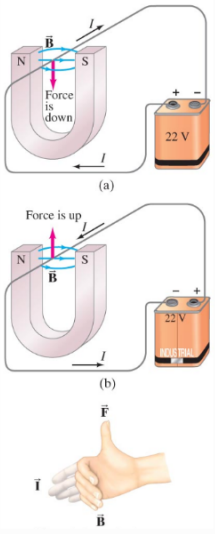



* The direction of magnetic field is found using the right hand rule!

magnetic field due to a current loop:




Force on a current carrying wire:




$F = I \ell B \sin\theta$

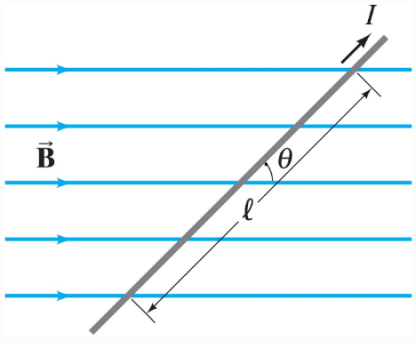
$\vec{F} = I\vec{\ell} \times \vec{B}$

↳ magnetic field vector

1 Tesla = 1 N/A·m

1 Gauss = $10^{-4}$ T

Example 27.1

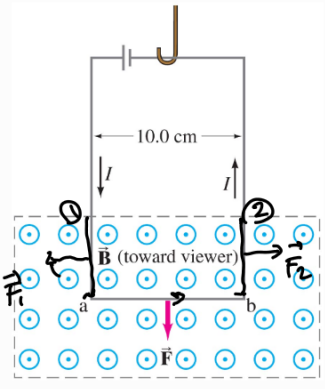



$\vec{F} = I\vec{\ell} \times \vec{B}$, $F = |\vec{F}| = I\ell B \sin\theta$

$I = 30\,A$, $\ell = 0.12\,m$, $\theta = 60°$ and $B = 0.90\,T$

$F = (30A)(0.12m)(0.90T)\sin 60° = 2.8\,N$

Example 27.2




$\vec{F} = I\vec{\ell} \times \vec{B}$, the direction of $\vec{F}$ is given by the second right-hand rule.

$I = 0.245\,A$

$\ell_{ab} = 0.10\,m$

$F = 3.68 \times 10^{-2}\,N$

* since $\ell_1$ and $\ell_2$ are the same, $F_1 = F_2$.

$F = I\ell_{ab}B\sin\theta$ → 90°

$F = I\ell_{ab}B \Rightarrow B = F/I\ell_{ab} = (3.68\times10^{-2}N)/(0.10m)(0.245A)$

$B = 1.42\,T$