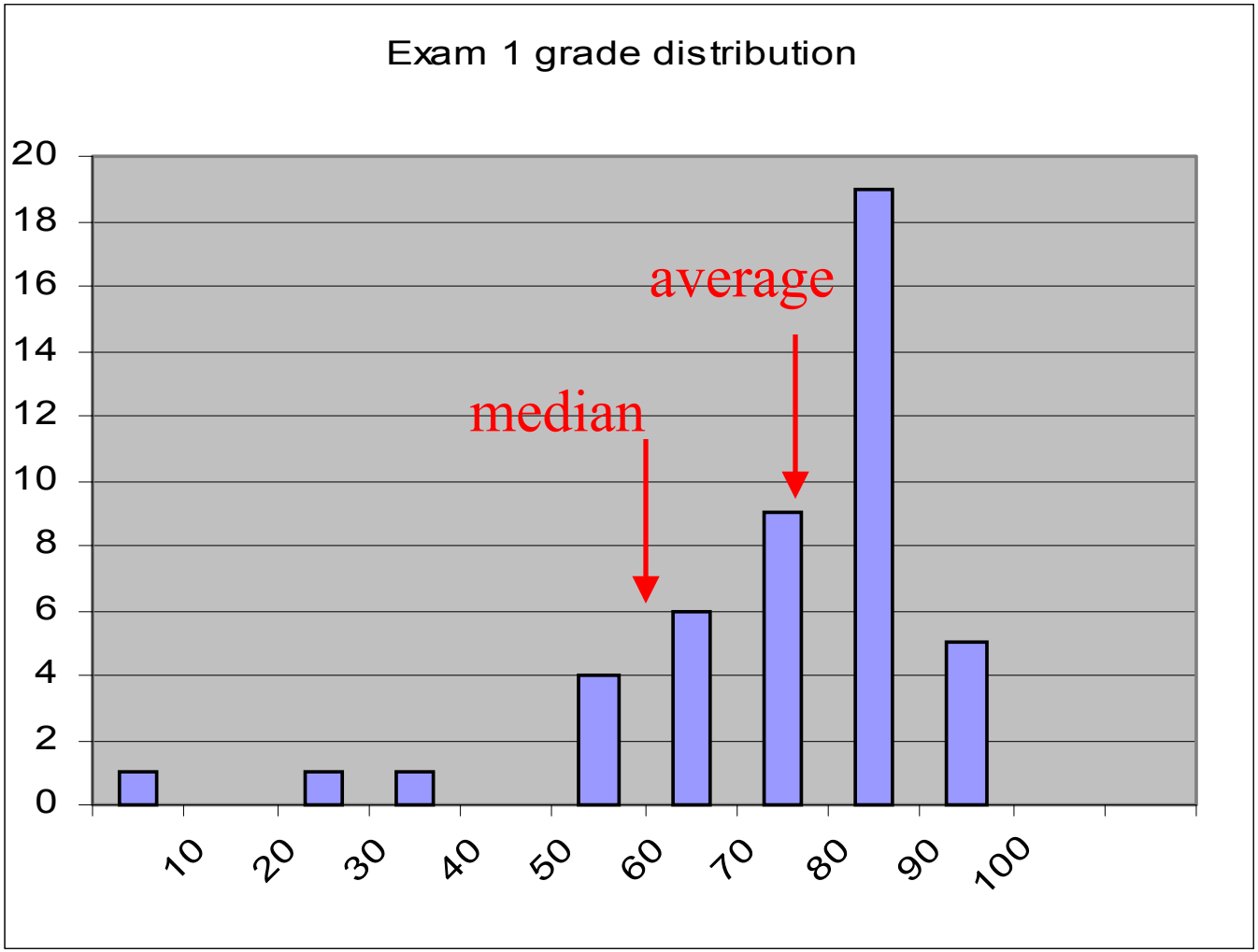
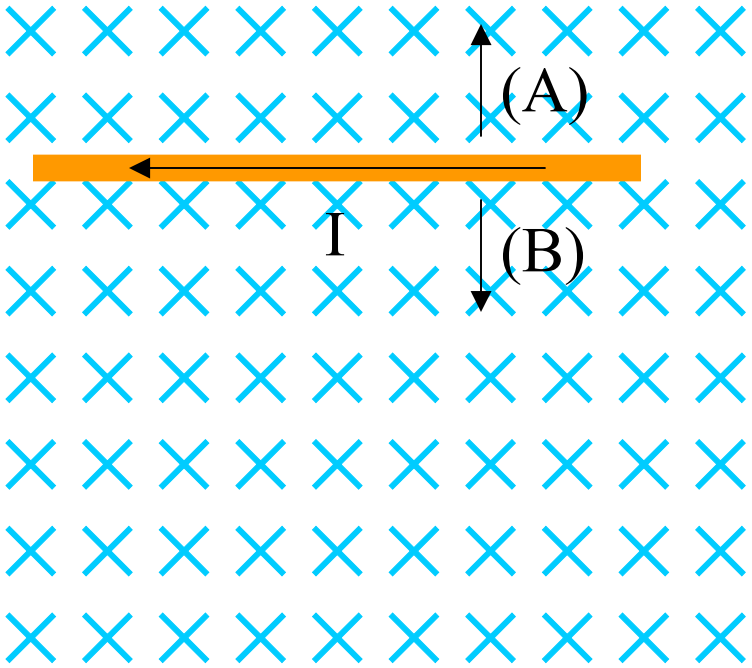
Announcements

1. Vote on what to do about Exam 1 (note: most of you can drop this exam grade)
    a. Rework exam and turn it in before by 11 AM on Monday (2/17) for 10 extra credit points which will be added to the total extra credit pool
    b. Rework exam ***on your own*** and turn it in by 11 AM on Monday (2/17). Your new score would be averaged with your old score
    c. (a) plus presentations of some sort...
    d. Other???
2. Continue discussion of magnetic forces


Exam 1 grade distribution
20
18
16
14
12
10
8
6
4
2
0
average
median
10
20
30
40
50
60
70
80
90
100

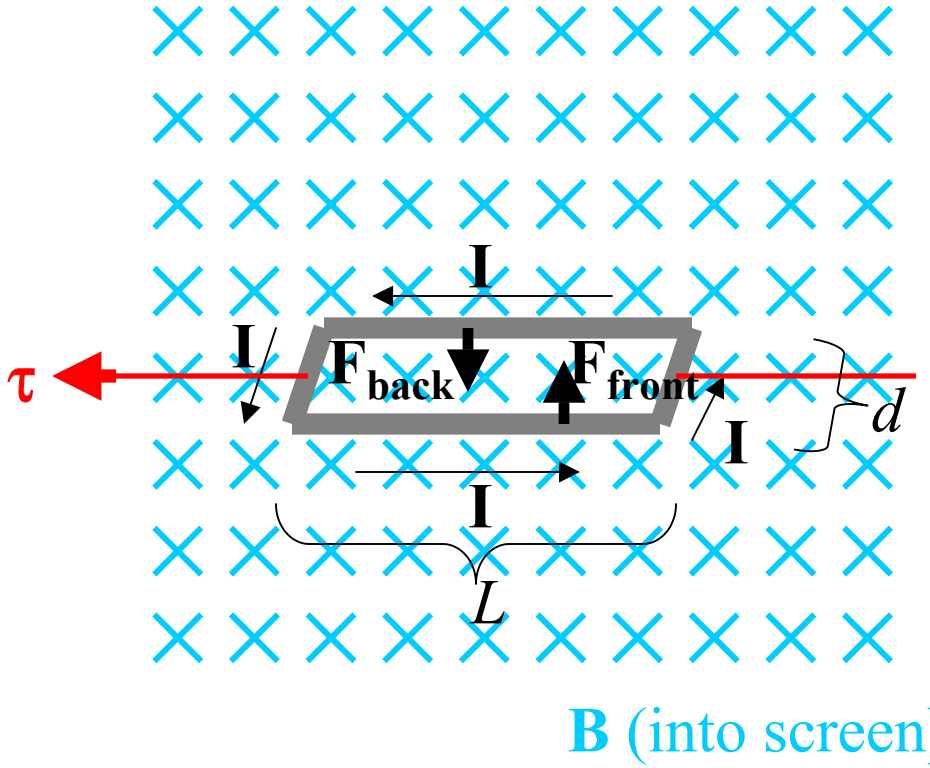
Peer instruction question



A current is flowing to left in a magnetic field pointing into the screen. Which arrow represents the direction of the magnetic force on the wire?

B (into screen)

Net forces on a current loop:



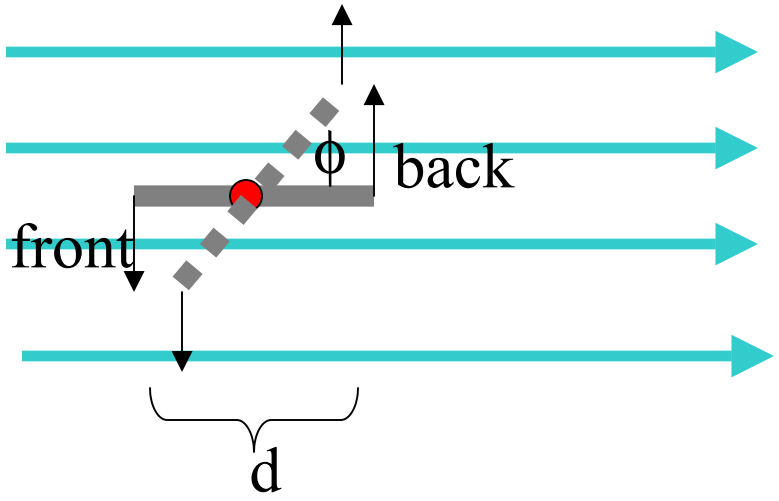
$\mathbf{F_{front}} = L\ \mathbf{IB\ (up)}$

$\mathbf{F_{back}} = L\ \mathbf{IB\ (down)}$

maximum torque on loop:

$\tau = dL\ IB$

Edge view of coil:

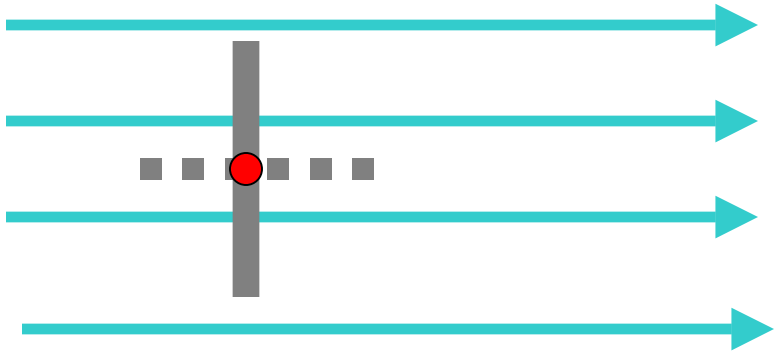


$\tau = dL\ N\ IB \cos\phi$

number of coils

length of coil perpendicular to field and pivot

Edge view of coil:



What is the net torque on the coil when it is in the upright configuration as shown?

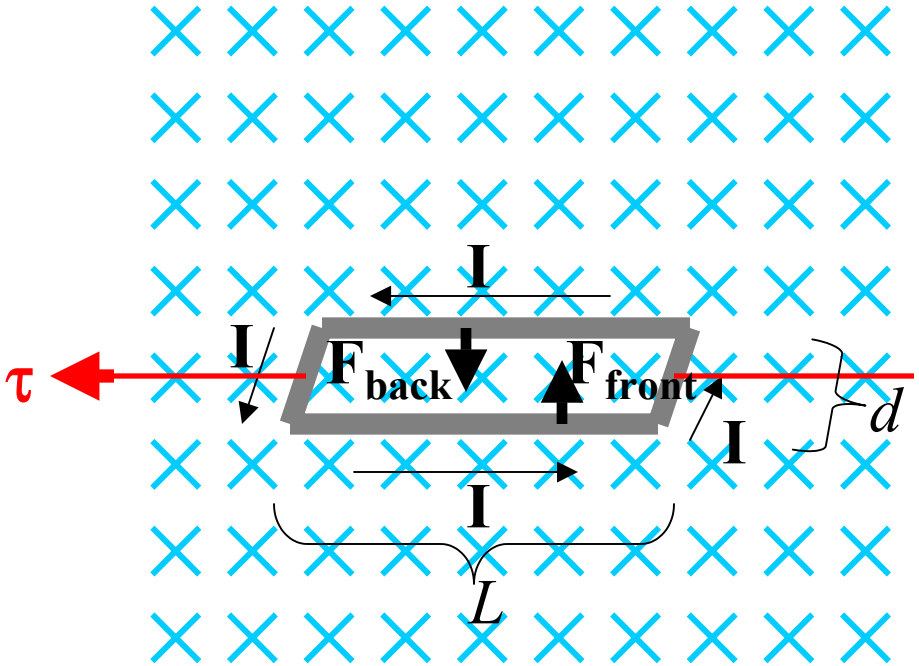
(A) $dL\ N\ IB$

(B) $2dL\ N\ IB$

(C) $\frac{1}{2}\ dL\ N\ IB$

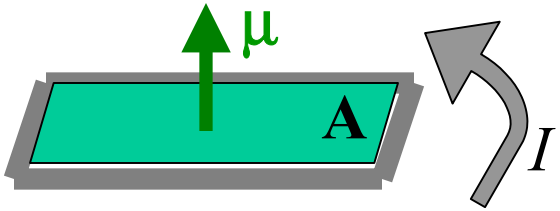
(D) 0

Magnetic "moment" associated with the current loop



$\tau = dL\ N\ IB \cos\phi$

$\mu = ANI$



$\tau = \mu \times \mathbf{B}$

Example from HW 11

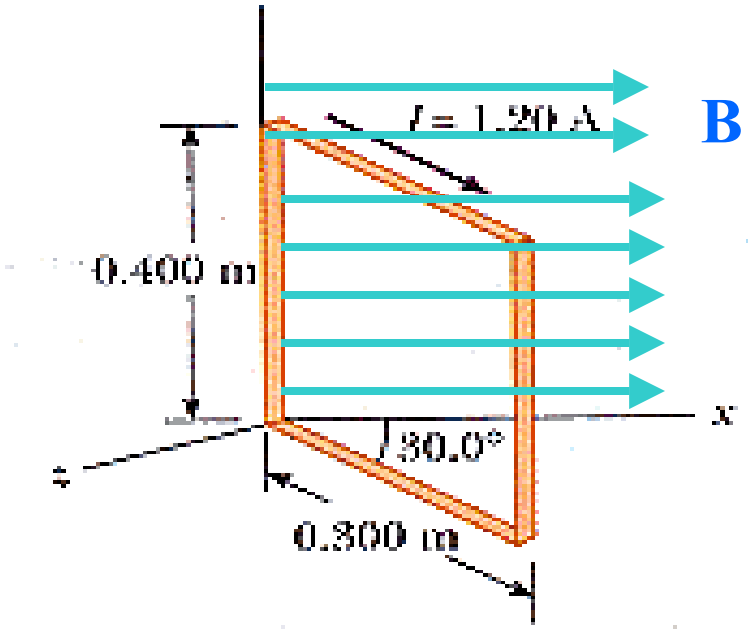


Figure P29.25.

Example from HW 10

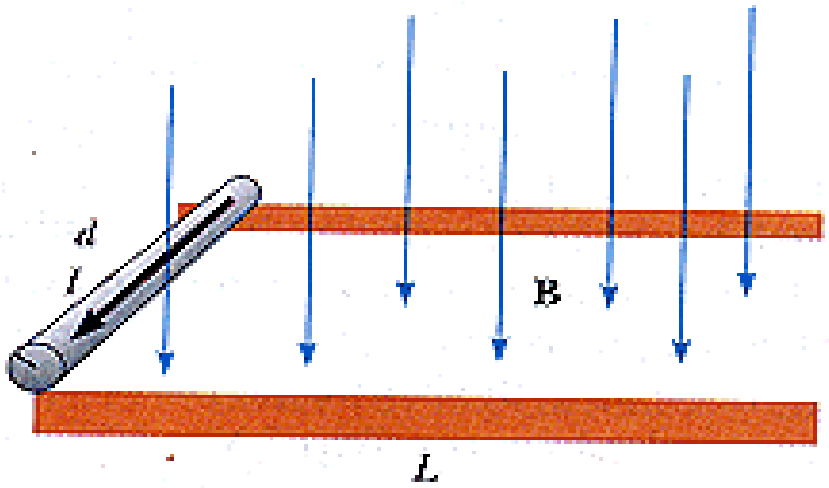


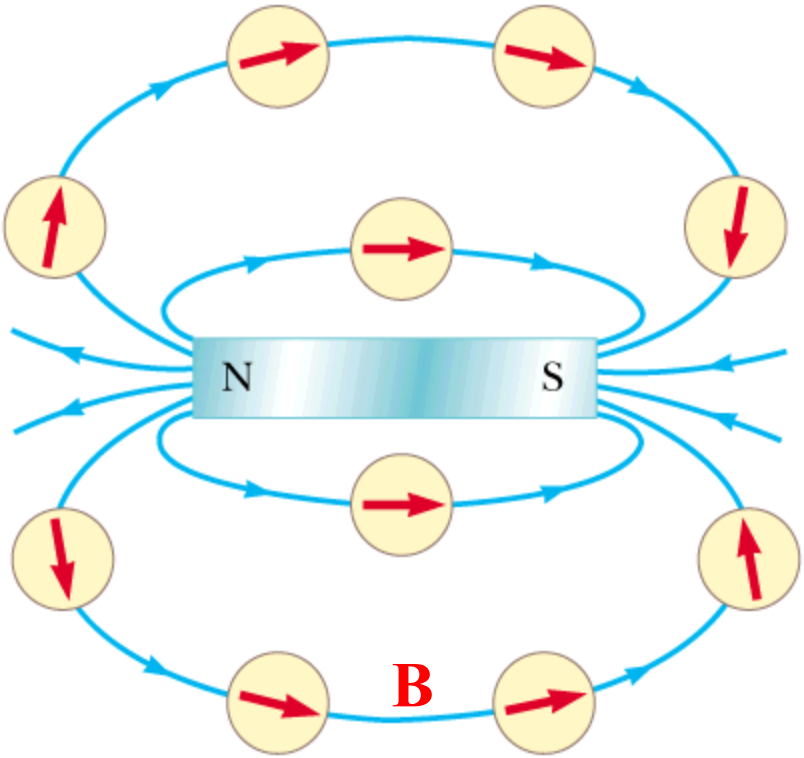
Figure P29.19.

What is the direction of the magnetic force?

Sources of magnetic field:

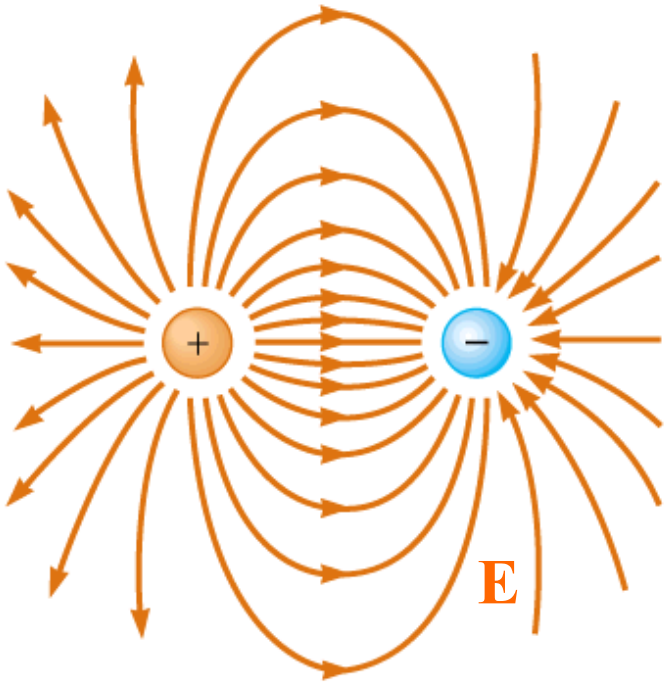
1. Ferromagnetic materials -- bar magnet
2. Currents and moving charges

Magnetic dipoles



Magnetic field lines associated with bar magnet

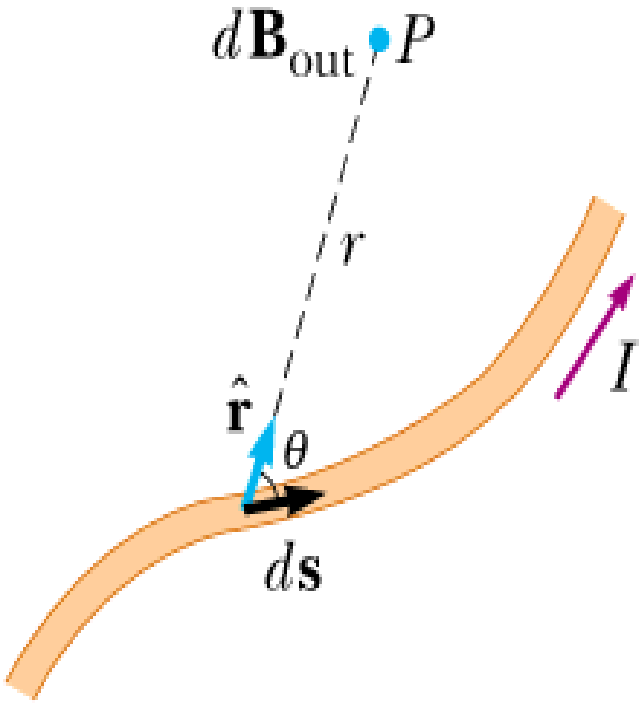
Electric dipole



Electric field lines

There are no magnetic "charges" (monopoles)

Biot-Savart law



$$d\mathbf{B} = \frac{\mu_0}{4\pi}\frac{Id\mathbf{s}\times\hat{\mathbf{r}}}{r^2}$$