

CONCEPT: SUMMARY OF MAGNETISM PROBLEMS

- Remember: Electric Charges and Magnets both **(a)** PRODUCE A FIELD and **(b)** FEEL A FORCE:

- Most Magnetism problems have to do with calculating the magnitude of:

(1) A(n) _____ Magnetic Field being PRODUCED;

(2) A Force FELT due to a(n) _____ Magnetic Field.

- We will calculate Fields PRODUCED BY and Forces FELT BY Electric → (i) _____, (ii) _____.

- What about Magnets? No calculations, only directions!

→ KEY Difference: Magnets **ALWAYS** Produce Fields AND Feel Forces.

- Electric CHARGES produce Fields AND feel Forces **ONLY IF** they are _____.

- Electric WIRES produce Fields AND feel Forces **ONLY IF** they have _____.

PRODUCING NEW B-FIELDS

NEW B-Field due to
Moving Charge

$$B = \frac{\mu_0 v q \sin\theta}{4\pi r^2}$$

↓ Charges can also move in Wires

NEW B-Field due to
WIRE with Current

$$B = \frac{\mu_0 I}{2\pi r}$$

↓ Wires can be made into Loops

NEW B-Field through center
of **Wire LOOP** (with i)

$$B = \frac{\mu_0 I}{2R} N$$

↓ Really long loops are *Solenoids*

NEW B-Field inside
Solenoids (LONG loops)

$$B = \frac{\mu_0 I}{L} N$$

FEELING FORCE IN B-FIELDS

B-Force on **Moving Charge**
in EXISTING B-Field

$$F = v q B \sin\theta$$

B-Force on **WIRE w/ Current**
in EXISTING B-Field

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

B-Torque on **Wire LOOP**
in EXISTING B-Field

$$\tau = N B A I \sin\theta$$