Name: Date: Period:

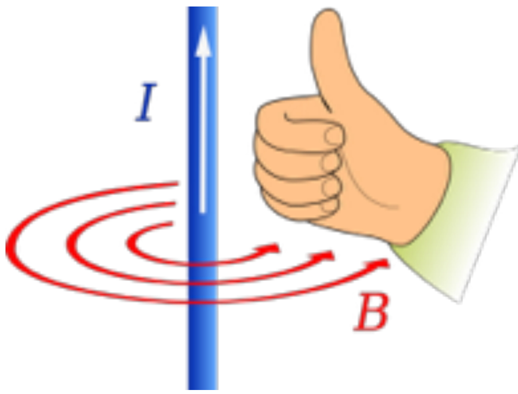
Magnetism Review WS 2

Use the word bank at the end of the worksheet to fill in the blanks below. Some words or phrases may be used more than once.

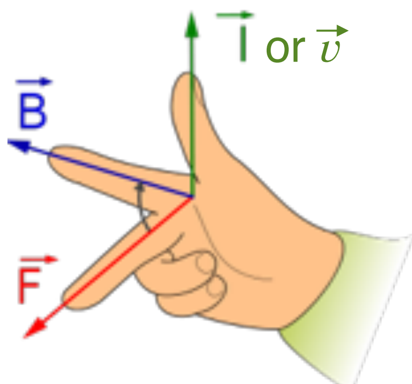
Review the Concepts

- A magnetic field is produced by the *motion of charge*
  - In a magnetic substance such as iron, the magnetic fields created by *spinning electrons* do not cancel one another out.
  - Large clusters of magnetic atoms align to form *magnetic domains*
  - In nonmagnetic substances, electron pairs within the atom spin in *opposite directions*; there is no net magnetic field
- *Electric current*, or the flow of electrons, produces a magnetic field
  - Bending a current-carrying wire into coils *intensifies* the magnetic field
    - The more coils, the *stronger* the magnetic field
  - Placing a piece of iron into a current-carrying coil creates an *electromagnet*
- A *moving* charged particle may be *deflected* by a magnetic field
  - Deflection is greatest for particles moving *perpendicular* to the magnetic field and zero for particles moving *parallel* to the field
- Magnetic polarity comes in two flavors: *north* and *south*
  - Magnetic field lines run from *north to south*
- The Earth's magnetic field is produced by the charge in the planet's *iron core* set in motion by the *rotation* of the Earth
  - Earth's magnetic field appears to be *weakening*, which scientists believe indicates the poles are destined to *flip-flop*
- According to Faraday's Law, a *changing magnetic field* within a coil of wire will *induce a voltage*
- A transformer uses *electromagnetic induction* to induce a voltage in the secondary that is different from that in the primary
- A changing magnetic field induces an *electric field*

- A changing electric field induces a *magnetic field*
- Right Hand Rule is all about figuring out *direction*
  - Two versions:
    1. Magnetic field induced around a current-carrying wire



    2. Force on a current-carrying wire or moving charge in an external magnetic field



- If you're dealing with a negative charge in an external magnetic field, you may use your *left hand* to find the relative directions, but then drop the negative sign in your calculations
- In physics, a negative sign just means "opposite direction"
  - Ex. - up = + down
  - - left = + *right*
  - - in = + *out*

For each of the following, fill in the given info, what you need to solve for, what equation(s) you will need to use, those equations with the given info filled in, and the final answer.

1. A proton is launched into a uniform magnetic field of 3.5 T into the page. Inside the field, the proton experiences 5.2×10^{-11} N of force to the left. What must be the speed and direction of the proton as it travels in the field?

Given:

$\mathbf{B} = 3.5$ T in

$\mathbf{F} = 5.2\times10^{-11}$ N left

Solve for:

$\upsilon = ?$

Equation(s):

$\mathbf{F} = q\,\upsilon\mathbf{B}$

Eq. with given:

$5.2\times10^{-11}\text{ N} = (1.6\times10^{-19}\text{ C})\,\upsilon\,(3.5\text{ T})$

Solution:

$\upsilon = 9.3\times10^{7}$ m/s up

2. A coil of wire containing 110 loops is placed in a magnetic field that oscillates between 7.3 T and 12.4 T every 1.3 s. If the induced voltage is 0.5 V, what must be the radius of the coil?

Given:

$N = 110$

$B_f = 12.4$ T

$B_i = 7.3$ T

$\Delta t = 1.3$ s

$V = 0.5$ V

Solve for:

$r = ?$

Equation(s):

$A = \pi r^2$

$\Delta\Phi = A\Delta B$

$V = N\Delta\Phi/\Delta t$

Eq. with given:

$A = \pi r^2$

$\Delta\Phi = \pi r^2(12.4\text{ T} - 7.3\text{ T})$

$0.5\text{ V} = (110)\,\pi r^2(12.4\text{ T} - 7.3\text{ T})/1.3\text{ s}$

Solution:

$r = 0.019$ m or 19 mm