Electricity & Magnetism (E&M)

HS-PS2-5, 3-5:

HS-PS2-5. **Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.** [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]

Learning Targets:

I CAN…

- **LT1 - Identify the symbol and units of measurement for electric current, voltage, resistance, and power.**
- **LT2 - Use Ohm's Law to calculate current, voltage, and resistance.**
- **LT3 - Calculate electric power based on two of the three quantities listed above.**
- **LT4 – Calculate the cost of electric energy given the power of a device and the cost of the energy in kW*hr.**
- **LT5 - Recognize and explain what causes magnetic fields.**
- **LT6 - Identify the shape and direction of the magnetic field around a bar magnet.**
- **LT7 - Distinguish between magnetic fields and electric fields.**
- **LT8 - Describe the relationship between magnetic and electric fields, i.e., electromagnetic induction.**

LT1 examples:

The abbreviation for current is _____ The abbreviation for voltage is_____

The abbreviation for resistance is _____ The abbreviation for power is _____

The SI Unit for current is_____ The SI Unit for voltage is_____

The SI Unit for resistance is_____ The SI Unit for power is_____

LT2 examples:

A. If a light bulb draws 0.125 Amps from a household line of 120 Volts, what's the effective resistance of the bulb?

B. If a toaster has a resistance of 30.0 Ohms, how much current does it draw when connected to 120 Volts?

C. What voltage is needed to create a current of 3.0 mA in a resistance of 1500 Ohms?

LT3 examples:

D. If a light bulb draws 0.50 A at 120 V, what's the power rating of the bulb?

F. If a 75 Watt light bulb is connected to 120 V, calculate the current in *and* resistance of the bulb.

G. A 1.5 W indicator light is connected to a circuit. If the resistance of the bulb is 150 Ohms, what is the current in the bulb?

LT4 examples:

H. The cost of electrical energy in a particular community is $0.08 / kW*hr. How much does it cost to leave a 15 Watt security light on every day? How about for a year?

I. The cost of electrical energy is a particular community is $0.12 / kW*hr. How much does it cost to watch a large screen television 2.00 hours a day for an entire year, if the TV, sound system, and DVR it's connected to convert energy at a rate of 275 Watts?

LT5 examples:

A. A student has a 9 Volt battery, a length of wire and an iron nail. How can she use those materials to create a magnetic field?

B. A student asks you for help on a question...he says "What *is* the cause of magnetic fields?" What is your accurate response?

C. What metals are easily magnetize-able?

LT6 examples:

D. A bar magnet has two poles, a north seeking pole and a south seeking pole. Why do we call them "north seeking" and "south seeking" poles rather than simply "positive" and "negative?"

E. Draw a bar magnet, label the ends with a polarity, and draw the shape of the magnetic field around the bar magnet. Indicate the direction of the magnetic field with some arrows.

LT7 examples:

F. What do north magnetic poles do to other north magnetic poles?

G. If you want to create a large magnetic field with an electric charge, what do you have to do to the electric charge?

LT8 examples:

H. What is electromagnetic induction (EMI)?

I. How does EMI relate to radio waves or visible light?

I. Name at least four technological items that rely on EMI to function.