Name:_____ Points:___/10

SMITH - INDUSTRIAL SCIENCE B- 3RD PERIOD - OFF-SITE LEARNING PACKET DAY 1

Chapter 9 Electricity
Lesson 1 – Electric Charge

Lesson Objectives

- **define the bellwork vocabulary words** (**atom, proton, neutron, electron**) with 100% accuracy
- **state what causes electric current to flow in a circuit** with 100% accuracy
- **state the subatomic particle associated with current electricity in a solid** with 100% accuracy

Associated Text:

Chapter 9 Lesson 1

Lightning is an easily visible manifestation of electricity.

Introduction to Electricity

Electricity underlies just about everything around us. It's in the lightning in the sky, it's in the spark beneath our feet when we scuff across the rug, and it's what hold atoms together to form molecules. The control of electricity is evident in technological devices of many kinds, from lamps to computers. In this technological age it is important to have an understanding of the basics of electricity and of how these basic ideas can be manipulated to produce a standard of living unknown before recent times.

This section begins with the concept of electric charge. Conveniently there are only two types of electric charge. We will study the forces between them, the aura that surrounds them, and their behavior in materials. We learn that electric current is the flow of electric charges produced by an electrical pressure called voltage. In this section we see that electric currents produce magnetism, and how both can be controlled to operate meters and motors. Understanding the underlying concepts of electricity requires a step-by-step approach, as one concept builds upon the next.

Nature

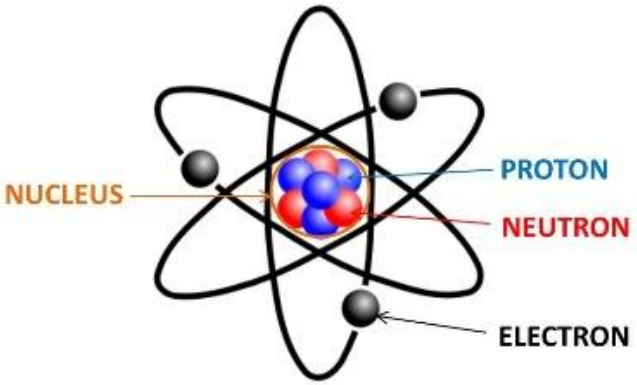
What if there were a universal force that, like gravity, varies inversely as the spare of distance but is billions of times stronger? If there were such a force and if it were attractive like gravity, the universe would be pulled together into a tight ball, with all matter pulled as close together as it could get. But suppose this force were a repelling force, with every bit of matter repelling every other bit. What then? The universe would be an ever-expanding gaseous cloud. Suppose, however, that the universe consisted of two kinds of particles – positives and negatives, say. Suppose positives repelled positives but attracted negatives and negatives repelled negatives but attracted positives. In other words, like kinds repel and unlike kinds attract.

The universe we live in is possible only because of the underlying nature of the four fundamental forces. Electricity is a part of one of the four forces, the electro-magnetic force.

Suppose there were an equal number of each so that this strong force was perfectly balanced. What would the universe be like? The answer is simple: It would be like the universe we are living in. For there are such particles, and there is such a force. We call it the electric force.

Electric Charge

The terms *positive* and *negative* refer to electric *charge*, the fundamental quantity that underlies all electrical phenomena. The positively charged particles are protons, and the negatively charged particles are electrons. The attractive force between these particles causes them to lump together into incredibly small units, which we call atoms. (Atoms also contain neutral particles called neutrons.) Most of the interesting details about atoms will be presented in a later section. To understand the basic principles of electricity, however, it is important to be aware of some fundamental facts about atoms:



A model atom.

1. Every atom is composed of positively charged *nucleus* surrounded by negatively charged electrons.
2. The electrons of all atoms are identical. Each has the same quantity of negative charge and the same mass
3. Protons and neutron compose the nucleus. (The common form of hydrogen that has no neutron is the only exception.) Protons are about 1800 times more massive than electrons but carry an amount of positive charge equal to the negative charge of electrons.
4. Neutrons have slightly more mass than protons and have no net charge.

Image URLs

http://2.bp.blogspot.com/-c2U3HUQZVy8/UV7KI2bodLI/AAAAAAAAA4g/DJEEmv-FmNY/s1600/galaxy_universe-normal.jpg
https://www.kullabs.com/uploads/55254826e4b0baeae3c80f3a-eabollich-1428509554189-atoms1.jpg
http://starconnectmedia.com/wp-content/uploads/2016/05/Lightening.jpg

Guided Reading Questions: ***(10 pts.)***

use the chapter text and guided notes found above

Electric Force and Charge

1. Which is stronger, the electric force between an electron and a proton or the gravitational force between these particles? Is the difference between these forces large or small?

2. Why does gravitational force predominate over electric force for astronomical bodies?

3. What causes electric charges to flow in a wire?

4. How many kinds of electric charges are there?

5. What are the names of the electrical charges?

6. How does the charge on an electron compare to the charge of a proton?

7. What are the relative sizes of the sub-atomic particles?

8. Do electrons vary in the amount of charge they contain?

9. Do electrons vary in their masses?

10. Where is most of the mass of an atom found?

11. How much bigger is a proton compared to an electron?

Lesson Notes
Electricity
Electric currents

- the flow of electric charges through a conductor
- are produced by an electrical pressure called voltage
- always are associated with a magnetic field that is produced by the current itself

Electric Force and Charge
Electric force:

- consists of two equally balanced forces
- force proportional to $1/d^2$
- billions of times stronger than gravity force

Electric Charge

- protons: positive (+) charged
- electrons: negatively (-) charged
- opposite charges attract
- like charges repel

Atoms:

- positively charged nucleus surrounded by cloud of negatively charged electrons
- all electrons are identical
  - same mass
  - same charge
- nucleus
  - protons, neutrons
  - 99.9 % mass of atom
  - very small
- protons
  - 1856x more mass compared to electron
  - same amount of charge
- neutrons
  - slightly bigger than protons
  - no charge
  - act like glue to hold nucleus together

Vocabulary
Atom – smallest distinct unit of matter
Proton – positively charged subatomic particle
Neutron – non-charged subatomic particle
Electron - negatively charged subatomic particle