*Electricity Lesson 1: Static Electricity*

1. Matter: anything that has mass and takes up space
    a. All matter is made of tiny particles
    b. Some particles have units of electricity called electric charges

**Positive and Negative Charges**

2. An electric charge can be positive (+) or negative (--)
3. Most matter is neutral
    a. A neutral object has the same number of positive and negative charges.
4. Only negative charges can move
5. If negative charges move from one neutral object to another, the first object has a positive charge. The second object has a negative charge.
6. The form of energy that comes from charged particles is called electrical energy
    a. Negative electric charges can move from one object to another.
        i. When this happens, an electric charge builds up on both objects.
            1. One object has a positive charge and the other has a negative charge
7. The buildup of electrical charges on an object is called static electricity
    a. An object charged with static electricity has a buildup of electric charges on its surface.
    b. Objects with a buildup of like charges repel each other.
    c. Objects with a buildup of unlike charges attract each other.
8. Examples:
    a. Combing your hair (if you have any): Both comb and hair are neutral. When you use the comb, (--) charges jump from your hair to the comb. Your hair sticks to the comb because it is (+) charged and the comb is (--). Remember: opposites attract.
    b. Socks in the dryer: When your socks spin in the dryer, (--) charges jump from one object to another. This charges the clothes with static electricity

**Attracting Neutral Objects**

9. Why does a charged balloon stick to a neutral wall? The rubbed balloon has extra negative charges that repel the negative charges in the wall. This makes part of the wall positively charged. Because opposites attract, the balloon (negative) sticks to the wall (positive)

**Shock, Spark, and Crackle**

10. When you rub your shoes against the rug, negative charges move from the floor to your shoes. The charges then move from your shoes to your body.
    a. You're now charged with static electricity
11. Do charges that build up this way stay on the charged object for long? No
    a. Charges may leak harmlessly into the air
    b. The charges may jump when static electric charges move off a charged object
        i. This is called an electric discharge

**Lightning**

1. What causes lightning?

a. During a thunderstorm, positive charges build up on top of a cloud.
b. Negative charges build up at the bottom of the cloud.
    i. These (-) charges repel (-) charges on the ground
        1. This makes the ground (and objects on the ground) positively charged
c. When negative charges jump between the cloud and the ground, there's a giant electric discharge (spark)
    i. This spark is lightning

## *Lesson 2: Electric Current*

1. What are some ways you depend on electricity? _____

**Charges in Currents**

2. Static Electricity: the buildup of electric charges on an object
    a. Static charges can jump quickly between objects
    b. The problem with Static Electricity: it's difficult to control
    c. For electric charges to be useful, they have to flow
3. In the electricity used in homes and businesses, the electric charges flow steadily, like currents in a stream
    a. Electric current: continuous flow of negative charges
    b. Electric circuit: the path along which negative charges can flow

**Open and Closed Circuits**

4. In a closed circuit, there is NO break in the pathway of negative charges
    a. Charges CAN flow through a closed circuit. The light bulb can light!
5. In an open circuit, there is a break in the pathway.
    a. Charges CAN'T flow through an open circuit. The light bulb can't light!
6. Switch: a device that opens or closes a circuit
    a. Switch on: the circuit is **closed** and complete
    b. b. Switch off: the circuit is **open** and incomplete

**Conductors and Insulators**

7. Electricity moves more easily through some materials than others
8. Conductors: materials that allow electricity to pass through them easily
    a. Examples: most metals, like copper
9. Insulators: materials that don't let electricity pass through them easily
    a. Examples: plastic, rubber, wood, paper, cloth, ceramics
    b. Electrical cords use insulators to protect people when they plug them in. The electricity flows through the copper wire, which is a conductor. The charges can't get through the covering, which is an insulator

## *Lesson 3: The Light Bulb*

1. Incandescent bulbs: use a filament to produce light (and heat); filament glows when electricity passes through it
2. Fluorescent bulbs: electric charges bump into particles of mercury gas; this creates ultraviolet light which reacts with the white coating to make light

3. In incandescent bulbs, energy changes to heat and light
    a. They produce more heat than light, so they get very hot. This means they waste electricity
4. In fluorescent bulbs, electricity changes one form of light to another
    a. They produce much less heat and waste less

**Invention of the Light Bulb**

5. Thomas Edison: given credit for inventing the light bulb
    a. His first light bulb used scorched thread as a filament
        i. It was expensive and didn't last long
6. Lewis Latimer: improved Edison's light bulb
    a. Latimer used carbon for a filament
        i. The bulb cost less money and lasted longer
7. Today, tungsten is used as a filament

## *Lesson 4: Series and Parallel Circuits*

1. Series Circuit: circuit that has only one path for current to flow on
    a. All of the parts are connected in a single loop or path or one after another
    b. Charges flow from the battery, through the first bulb, through the second bulb, and back to the battery
    c. If either bulb is removed, the circuit will not work
2. Parallel Circuit: circuit has more than one path to flow on
    d. If a bulb is removed, current still flows
        i. This means the other bulb still lights

**How Homes are Wired**

3. The electric appliances and lights in your home are linked to circuits
4. Circuits in homes are parallel, not series
    e. Why? So that if one part of the circuit doesn't work, the other parts still do
5. Every circuit has a fuse or circuit breaker
    f. These devices open circuits when they get too much electricity
    g. Fuse: contains a metal strip that melts when it overheats
    h. Circuit Breaker: a switch that opens a circuit by turning itself off