Thunderstorms and Static Electricity

Objective/Purpose:
The purpose of this lesson is for students to gain a general understanding of thunderstorms, concentrating specifically on what causes lightening. Students will be given information about thunderstorms during a teacher-lead discussion. Students will understand the following concepts:

1. A thunderstorm has rain, thunder, and lightning. By definition it must contain lightening and thunder.
2. Static electricity is the cause of lightening.
3. Lightning forms because of an accumulation of electrical charges inside a cloud due to dust, ice, and water droplets.

Materials
- wool cloth (students’ sleeves from t-shirts works just as well)
- balloons
- ground pepper
- plastic utensils
- paper plates
- Worksheets

Time:
Approximately one to one and a half hours are needed for entire lesson. The time could be shortened if you work individually with small groups of students.

Background Information:
- What is a thunderstorm?
  - A thunderstorm has rain, thunder, and lightning.
  - By definition, a thunderstorm has to contain lightning and thunder.
  - Heavy rain from thunderstorms can produce flash floods.
    - Flash floods are the most dangerous kind of floods, because they combine the destructive power of a flood with incredible speed and unpredictability.
  - Hail can result during a thunderstorm as well
    - Hail is precipitation in the form of odd-shaped icy lumps called hailstones.
    - Hailstones have been found in sizes ranging from pea size to baseball size. The largest hailstone in the US weighed 1.67 pounds and was 5.5 inches in diameter.
  - Thunder
    - The flash of a lightning strike and resulting thunder occur at roughly the same time
    - Lightning causes thunder because a strike of lightning is incredibly hot.
    - Lightning always produces thunder.
  - Lightning
    - Static electricity is the cause of lightning, it is just a much smaller version
    - The accumulation of electrical charges in a cloud actually causes lightening
  - Static electricity
    - For example, it's the charge that you create when you scuff your feet on a rug. Then when you touch a doorknob, you get a small shock. That's static electricity.
    - Every object is made up of billions of tiny particles, called protons and electrons. These particles are so small they can only be seen with special microscopes.
    - Lightning is like static electricity, except on a much bigger scale. Both lightning and static electricity happen because of the attraction between the opposite charges.

Preparation:
There are a total of three experiments that each group will complete. I divided my class into five
groups with four students in each group. The same materials are used throughout the experiments, so if you want to save on the costs than you can give each group a container that holds all of the materials listed for the lesson. However, I would suggest bringing the ground pepper to each group and distributing it for yourself. With this container give the students the procedures that they will need for each of the experiments. I suggest doing the ground pepper activity last, so that you can dispose of the materials after this particular experiment, or you will have kids playing with the pepper throughout the other two activities. The worksheet I gave my students is included in this package, as well as the written procedure I supplied each group. You should lead each activity and have the students read the steps along with you.

Safety Issues:
I would suggest using plastic spoons for the experiment so that students do not poke each other with the plastic forks or knives. Warn the students to be cautious when dealing with the pepper so that they do not get it in their eyes or mouth. Remind them that the pepper should stay on the plate or utensil and should not be “blown” off either.

Activity Outline/Teacher Procedure
- Introduce the topic of storms, lead into thunderstorms in particular
- Lead students in a discussion of thunderstorms, noting the general characteristics of the storm
- Describe static electricity and how it relates to thunderstorms (lightening)
- Introduce Experiments (written procedure I handed out appears below)
  - Students should record predictions prior to each experiment on the handout provided
  - First Activity: “Grounded Pepper”
    - Materials: paper plates, ground pepper, plastic utensils, wool cloth
    - Steps:
      - Rub plastic utensil back and forth with wool cloth. Hold utensil about one inch over the pepper. Observe what happens and record results
  - Second Activity: “Balloon Magnets”
    - Materials: a balloon, wall, wool cloth
    - Steps
      - Rub balloon briskly with wool. Place balloon against wall and let go. Observe what happens and record results
  - Third Activity: “Sparking Balloons”
    - Materials: two balloons, wool cloth (or your own sleeve)
    - Steps
      - Darken room as much as possible. Rub two balloons separately with wool cloth. Rub two balloons together. Observe what happens
      - The students will see tiny sparks, hear small noise, or feel small “shock”

Possible Questions:
How can you tell how far the lightning is by the sound of the thunder?
Does lightening always produce thunder?
Do you think that lightening is fast? Hot?
What are your predictions concerning each experiment? Outcome?

Assessment:
Students should be continually assessed through participation during discussion and group demonstrations Assessment should also be based on completion of the worksheet from the demonstrations (prediction/observation sheet). You may also ask your students to write a few sentences about each demonstration and how it related to lightening (static electricity) or focus on one demonstration.