Lesson Title	Shocking Chemistry
Length of Lesson	50 Minutes
Created By	Hannah Box
Subject	Chemistry
Grade Level	7^{th} & 8^{th} grade science
State Standards	Eighth Grade: 1d, 1g, 1h
DOK Level	DOK 3
DOK Application	Compare, Investigate, Hypothesize
National Standards	5-8: A: Inquiry & B: Physical Science
Graduate Research Element	Atoms and molecules also exhibit attractive and repulsive forces.

Student Learning Goal:

State Standards:

1d: Analyze evidence that is used to form explanations and draw conclusions. (DOK 3)
1g: Justify a scientist's need to revise conclusions after encountering new experimental evidence that does not match existing explanations. (DOK 3)
1h: Analyze different ideas and recognize the skepticism of others as part o the scientific process in considering alternative conclusions. (DOK 3)

National Standards:

5-8: A: Inquiry
Scientific investigation sometimes results in new ideas and phenomena for study, generate new methods and procedures for an investigation, or develop new technologies to improve the collection of data. All of these results can lead to new investigations.

5-8: B: Physical Science
Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy id transferred in many ways.

Students will be asked what they know about static electricity. They will be taught that this common occurrence is actually caused by electrons being excited and jumping from one substance to another. This transfer of electrons causes substances to become charged. The students will be able to charge several substances by rubbing them together and will observe how the charged substances react with different materials. They will then be asked to apply their years of experience with static electricity to find other way to charge the substances.

Materials Needed (supplies, hand-outs, resources):

1 vinyl record per group, rice cereal (1 cup per group), paper plate (1 per group), wool fabric. 1 balloon per group, one box unflavored gelatin mix per group, one box flavored gelatin mix per group, salt and pepper, and one plastic spoon.

Lesson Performance Task/Assessment:

Students will be given a handout on which they will be asked to make their observations. Using their knowledge of the atom, they will be asked to answer several questions about what is taking place and what has caused the phenomena.

Lesson Relevance to Performance Task and Students:

The students will be able to apply their knowledge of the atom and its subatomic particles to the activities that they have preformed.

Anticipatory Set/Capture Interest:

Separation of salt & pepper using a plastic spoon and static electricity: Mix salt & pepper in a 1:1 ratio. Rub a plastic spoon with wool or animal fur and hold it one inch above the mixture to separate.

Guided Practice:

At the beginning of class the teacher will ask the students the students what they know about static electricity. Then the teacher will demonstrate how static electricity can be used to separate out salt and pepper mixtures using only a plastic spoon (Anticipatory Set). The teacher will mix salt and pepper in a 1:1 ratio. Next, they will take a plastic spoon and rub it with wool fabric. Hold the spoon an inch above the mixture and watch as the pepper is attracted to the spoon while the salt remains on the plate. Pepper is lighter than salt and that is why it is attracted to the spoon.

The teacher will then go into a discussion on what static electricity is and what causes it. Atoms are made of protons, neutrons, and electrons. These three building blocks are different from one another through their properties and characteristics. One property is the electrical charge. Protons have a positive charge. Electrons have a negative charge. Neutrons have no charge making them neutral species. The charge of one proton is equal in strength to the charge of one electron. When the number of protons in an atom equals the number of electrons, the atom has no overall charge. The protons and neutrons in the nucleus are held together very tightly. Normally the nucleus does not change. But some of the outer electrons are held very loosely. They can move from one atom to another. An

atom that loses electrons has more positive charges (protons) than negative charges (electrons). So the overall charge of the atom is positive. An atom that gains electrons has more negative than positive particles. It has a negative charge. These charged atoms are called ions.

Some materials hold their electrons very tightly. Electrons do not move through them very well. These things are called insulators. Plastic, cloth, glass and dry air are good insulators. Other materials have some loosely held electrons, which move through them very easily. These are called conductors. Most metals are good conductors.

How can we move electrons from one place to another? One very common way is to rub two objects together. If they are made of different materials, and are both insulators, electrons may be transferred from one to the other. The more rubbing, the more electrons move, and the larger the charge that builds up. Now, positive and negative charges behave in interesting ways. Did you ever hear the saying that opposites attract? Well, it's true. Two things with opposite, or different charges will attract, or pull towards each other. Things with the same charge will repel, or push away from each other.

So what does all this have to do with static shocks? Or static electricity in hair? When you take off your wool hat, it rubs against your hair. Electrons move from your hair to the hat. A static charge builds up and now each of the hairs has the same positive charge. Remember, things with the same charge repel each other. So the hairs try to get as far from each other as possible. The farthest they can get is by standing up and away from the others. And that is how static electricity causes a bad hair day! As you walk across a carpet, electrons move from the rug to you. Now you have extra electrons and a negative static charge. Touch a doorknob and you get shocked. The doorknob is a conductor. The electrons jump from you to the knob, and you feel the static shock. We usually only notice static electricity in the winter when the air is very dry. During the summer, the air is more humid. The water in the air helps electrons move off you more quickly, so you cannot build up as big a static charge.

This short discussion will be followed by a laboratory experiment, in which students will be placed into small groups (2-3) and will be given a vinyl record, piece of wool fabric, and a plate of rice cereal. The students will be asked to rub the vinyl record with the wool fabric and then hold it over the plate of cereal and observe what happens. The cereal should jump back and forth from the plate to the record.

Next, the students will be given a balloon, a plate of unflavored jello mix, and a plate of flavored jello mix. The students will blow up the balloon and tie it at the end. They will be asked to rub the wool on the bottom of the balloon and hold it an inch from the powder. By slowly raising the balloon they should see the powder form cone structures (stalagmites). They will repeat this experiment using the flavored mix and compare their results. They will be asked to make observations on what happened.

Independent Practice:

The students will be asked to write their observations on a handout as they work through the activities.

They will then have to answer questions about what is happening to the materials when they are rubbed together.

Remediation and/or Enrichment:

Remediation:

Individual IEP. Have students make there observations out loud. Brainstorm the questions as a group.

Enrichment:

Have other materials available to the students. Vary the cereal, have flavored gelatin mixes, etc. Have the students formulate hypotheses and test them using the various materials. Have them record and explain the different observations that they make.

Check(s) for Understanding:

Have the students apply what they already know about static electricity to the activities. (have them rub the balloon on their arms, pants, hair, etc) Ask them to investigate what works best.

After checking to make sure they can identify the parts of an atom and the charges that each one has, ask them what charge a atom will have if it has more electrons than protons, more protons than neutrons, and more neutrons than protons.

Closure:

Students will answer the "Checks for Understanding" questions as a group and complete the laboratory handout

Possible Alternate Subject Integrations:

Physics: Energy transfer

Teacher Notes:

Videos of these demos can be found on youtube.com and directions on the internet.