Gold Seal Lesson:

Copernicus Education Gateway

Author(s): ***Michael Lucky Voiselle***			***Lesson Title:*** ***ES-STATICALLY SPEAKING***			
Grade Span			***ICLE Application Model***			
K-4	***5-8*** ***XX***	***9-12***	***A***	***B***	***C*** ***XX***	***D***

Instructional Focus:

Writing Students write for a variety of purposes and audiences with sophistication and complexity appropriate to the grade level.
Speaking Students speak for a variety of purposes and audiences with sophistication and complexity appropriate to the grade level.
Science as Inquiry Students demonstrate knowledge and skills necessary to perform scientific inquiry.
Habits of Mind Students develop habits of mind including curiosity, open-mindedness and persistence.

Performance Task

Your task is to obtain the following materials and have fun with static electricity. You may work in groups of 4, however, each student must obtain the following materials and make an inexpensive electricity storage device. You will need a quart size mayonnaise jar, aluminum foil, small balloons, 2 small neon light bulbs available from Radio Shack for under $2, a plastic rod (30centimeters of half inch pvc piping will do), nylon cloth, a rubber band, and puffed rice or instant potato flakes. Follow directions carefully recording all observations, problems, solutions to problems, and all comments in your science journal. This will be an important reference to consult for you conclusion summary.

1. Blow up the small balloon so that it fits snugly on top of the wide mouth jar and tie the end of the balloon securely so that no air escapes.
2. Cover the balloon with a smooth layer of aluminum foil.
3. Trim the edges of the foil around the top of the jar so that 2centimeters of overhang is left.
4. Secure the foil around the mouth of the jar with a rubble band. Let this apparatus stand for a moment.
5. Place the neon bulbs on the tabletop. Charge the plastic rod by rubbing with the cloth.
6. Bring the rod close to the bulbs and record what you observe. You may want to darken the room for better observation. What do you think causes this?
7. Rub the rod several times again and transfer this charge to the aluminum foil of your apparatus by touching the foil.
8. Repeat this process several times being careful not to touch the aluminum balloon with your hands.
9. Darken the room and bring your hand slowly to the top of the sphere without touching it. Come extremely close. Record your observations. What do you think causes this effect? How far did the arc of light travel?
10. Attach the bulbs to the top of the sphere without bursting the balloon. You may tape the two leads to the foil as long as you are sure that the 2 leads make contact with the aluminum.
11. Repeat the charging (rubbing the rod and touching the aluminum) and discharging (hand close to the top of the foil) processes. Record observations. Why does the bulb emit light when charging as well as discharging?
12. Try placing a few potato flakes or puffed rice particles on top of the sphere and note the effects of the charging process on them. Repeat charging several times. What causes the observed behavior?

Stop here and summarize the experiment thus far including all observations, answers to questions, problems, solutions to problems and comments in a well written conclusion free from spelling and grammatical errors.

Each member of your group is to choose one of the following to investigate. You are to present your topic to the rest of the group in a 3-5 minute oral presentation. The presentation should include a demonstration, a well-organized talk, and any mathematical calculations that may follow. Each group member will take notes, ask questions, and include all chosen topics in a second write-up that is well written and free from spelling and grammatical errors. The summary must reflect your understanding for the concepts of static electricity presented.

1. Do you get more charge if you rub the rod in only one direction, or does it matter? Find 3 other cloth materials (cotton, fur, rayon). Repeat the experiment to determine if different materials produce different results.
2. What is the greatest distance through which you can get the electric spark to jump to your hand? If it requires 30,000volts to produce an arc through 1centimeter of dry air, calculate the voltage of your greatest arc.
3. Try 4 different designs for you storage device (foil without balloon, larger balloon resulting in a larger foil sphere, loosely crumpled ball of foil, foil wrapped around a square box, etc). Report the results of repeating the experiments above.
4. Do the bulbs emit more light if they are closer together or farther apart on the top of the aluminum balloon? Does one bulb emit more light if attached alone? What happens if both bulbs are attached in series? Does the placement of the bulbs make a difference (try placing one on top and one on the side, place both on opposite sides, place one on bottom near the mouth of the jar)?

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling.(ela1)
Follow oral or written directions. (ela4)
Present information in well-organized fashion that will be clear to the target audience. (ela11)
Use writing as a tool for learning in formats such as learning logs, laboratory reports, note-taking, journals and portfolios. (ela40)
Know and apply the principles of scientific inquiry. *(Implicit in this statement are the processes of prediction, estimation, developing hypotheses, drawing conclusions, evaluation, and following ethical principles and professional procedures.) (Not Ranked s*114)
Make observations using senses and instruments. Inferences and interpretations are arrived at based on observations. Classify observable properties and organize observations in a meaningful and logical way. (s5)
Understand electric current (i.e., the flow of electric charge) and apply it to conductivity, amperage, resistance, and circuits in parallel and series. (s29)

Scoring Guide:

RATE CRITERIA: 3=Excellent, 2=Satisfactory, 1=Unsatisfactory. 0=Does not attempt or does not understand

CRITERIA	**SCORE**
Experimental procedures and group work	_____
Storage device worked well and constructed neatly	_____
First summary addressed all procedures, questions, and observations	_____
First summary well written and free from spelling and grammatical errors	_____
Oral presentation to group well organized and delivered well	_____
Oral presentation reflected experimental work and demonstrated an understanding for chosen topic	_____
Second write-up well written and free from spelling and grammatical errors	_____
Second write-up demonstrates and understanding for all 4 topics	_____

Keywords

English Language Arts	Mathematics	Science
Reading Comprehension	Algebra Math in Daily Life	Earth Science Energy Scientific Inquiry
Writing Spelling Grammar Expository	Geometry	Life Science
Communications Oral Presentation	Statistics	Chemistry
Literature	Calculus	Physics Static Electricity Scientific Research
Other	Trigonometry	Other
	Other	