"Balloons and Static Electricity"

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I. DCPS Standards:

8.1.2 Test hypotheses that pertain to the content under study.

8.5.4 Recognize and describe that energy is a property of many systems and can take the forms of gravitational motion, the energy of electrostatic and magnetostatic fields, etc.

8.7.3 Investigate and explain that an object can be electrically charged either positively or negatively; objects with like charges repel each other and objects with unlike charges attract each other.

II. Goals:

Students will understand the relations of attraction and repulsion between electrostatic charges.

Students will recognize the attraction of a balloon to a surface such as a wall as an example of electrostatic force.

III. Objectives:

Students will hypothesize the result of placing a charged balloon near a wall and analyze the force of the balloon on the wall.

IV. Prerequisite Knowledge: Like charges repel one another, snd opposite charges attract one another. When two charges are in the vicinity of one other, there is electrostatic potential energy between them.

Electrostatic Induction: When an object with excess electrons (i.e. negatively charged) is brought near

certain types of surfaces, the electrons on the object tend to repel those on the surface. This leads to a net positive charge near the surface, due to a change in shape of the electron cloud near the surface. The positive charge of the surface then attracts the negatively charged object.

V. Essential Questions:

Why does a (sufficiently) charged balloon adhere to a surface such as a wall? What is the difference in response with an uncharged balloon?

VI. Materials: One or several balloons.

VII. Differentiating Instruction: This activity should pose no problem to speakers of English.

VIII. Rationale: This activity provides a simple demonstration of electrostatic attraction with balloons.

IX. Activity Procedure: The instructor explains the rules of attraction and repulsion for electrostatic charges, and that rubbing a surface against human hair tends to transfer electrons from the hair to the surface. Depending on the time allotted and preparation of students, electrostatic induction can be discussed. The instructor then mentions that the interaction between charges is an example of potential energy. A student volunteer is selected to rub the balloon on vigorously on his or her hair, and the class is asked to hypothesize about what will happen when the balloon is placed in contact with the wall. The students record whether or not their hypothesis was confirmed.

X. Evaluation and Assessment: [Assuming the balloon indeed sticks to the wall.] What force attaches the balloon to the wall? [Electrostatic attraction.] What is the origin of the charge on the balloon? [The electrons from the student's hair.] Optional: is there a difference between gravitational potential energy and electrostatic potential energy? [In gravitation, like masses attract, and there's no such thing as negative mass, as far as we know.] Students write their own statement in their lab notebooks saying what this demonstration has shown them about electricity.