

# INTERACTIONS BETWEEN CHARGES

(MODIFIED FOR ADEED)



## Science Concept:

Opposite electromagnetic charges/poles attract, and similar charges/poles repel each other.

## Objectives:

The student will:

- describe the interaction between like and opposite poles/charges; and
- collaborate to design an experiment.

## GLEs Addressed:

*Science*

[8] SA1.2 The student demonstrates an understanding of the processes of science by collaborating to design and conduct simple repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings.

[8] SB4.2 The student demonstrates an understanding of motions, forces, their characteristics, relationships, and effects by describing the interactions between charges.

## Vocabulary:

*atom-* a tiny particle; the smallest particle of an element

*electromagnetism-* magnetism developed by a current of electricity; a natural force arising from interactions between charged particles

*electron-* an elementary particle that has a negative charge of electricity and travels around the nucleus of an atom

*neutron-* an uncharged atomic particle

*proton-* an atomic particle that occurs in the nucleus of every atom and carries a positive charge equal in size to the negative charge of an electron

## Materials:

- Balloons (one per pair of students)
- Hot-dog shaped party balloons (two per pair of students)
- Twine (one meter per pair of students)
- Latch magnets (five per pair of students)
- Stick, rod, or dowel that will fit through the holes in the latch magnets (one per group)
- Strong bar magnets, with poles marked (two per group)
- Plastic wrap
- Nylon

## Activity Procedure:

### Gear Up

#### *Process Skills: observing and communicating*

1. Divide students into pairs. Distribute a balloon to each pair. Ask students to blow up their balloons and tie the ends. Ask students to gently rub the balloon against their hair. Individuals with longer hair can observe what happens when the balloon is held above their hair and/or all can put the balloon near a wall and observe.
2. Ask pairs to try to put their balloon together with the balloon of another pair without forcing them to touch.

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3. Discuss why people's hair stands up towards the balloon, why the balloon sticks to the wall, and why the balloons did not want to come together. Most students have observed this before and may know that static electricity has something to do with their observations.
4. Review the parts of an atom and the charges of each part (electron – negative, neutron – neutral, proton – positive). If necessary, explain that substances are naturally neutral. Ask students what is happening to the substances when they are rubbed together. What happens if the balloon gains electrons or loses electrons?
5. Ask students why the balloon attracts longer hair and sticks to walls when it gains electrons.

### Explore

#### *Process Skills: observing and collecting data*

6. Distribute two party balloons, twine, plastic wrap, and nylon to each pair. Explain students will explore how balloons with like and unlike charges interact with each other. Explain that plastic wrap, when rubbed against a balloon, will produce a positive charge and that nylon, when rubbed against a balloon, will produce a negative charge.
7. Ask students to blow up the party balloons and tie 30 centimeters of twine to each, and then tape the strings to the edge of a table so that there are 3 to 5 centimeters between each balloon.
8. Instruct students to rub one balloon with a piece of plastic wrap and the other with a piece of nylon. Direct students to observe and record what happens.
9. Instruct students to rub both balloons with the piece of nylon and observe and record what happens.
10. Instruct students to rub both balloons with the plastic wrap and observe and record what happens.

### Generalize

#### *Process Skill: communicating*

11. Record group results on an overhead or on the board. As a class, discuss student results. Ask students what the investigation demonstrates about substances with like and unlike charges.

### Explore

#### *Process Skills: observing and collecting data*

12. Explain students will explore what happens with latch magnets when they stack them on a stick. Distribute magnets and a dowel to each pair of students. Ask the pairs to stack the latch magnets together on the dowel. Ask students to tip some of the magnets over and observe the result. Ask students to rearrange the magnets on the dowel so that none are touching.
13. Divide students into groups of three to five. Instruct them to work as a team to design and conduct an exploration to determine what happens when the poles of two or more magnets interact with one another. Instruct groups to write their procedure and get approval before proceeding. Make sure students record their observations.

### Generalize

#### *Process Skill: communicating*

14. As a class, discuss what was observed during the exploration. Record results from each group on an overhead or on the board. As a class, formulate a theory regarding the interaction of like and opposite poles.

### Apply/Assess

#### *Process Skill: communicating*

15. Instruct students to write a two to three paragraph report describing what happens when opposite and like charges/poles interact with each other.

### Extension Ideas:

Assign students to research maglev trains and their relationship to the interactions of electromagnetic charges/poles.

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# RUBRIC

Objectives	GLE	Emergent	Developing	Proficient	Advanced
The student collaborates to design an experiment.	SA1.2	The student does not cooperate with his or her group, does not write the experiment procedure step-by-step, and/or does not follow teacher instructions.	The student cooperates with his or her group and follows teacher instructions, but does not write the experiment procedure step-by-step or does not follow the written procedure.	The student cooperates with his or her group, follows teacher instructions and writes and follows the experiment procedure step-by-step.	The student cooperates with his or her group, follows teacher instructions, writes and follows the experiment procedure step-by-step and includes a hypothesis and conclusion.
The student describes the interaction between like and opposites poles/charges.	SB4.2	The student does not explain basic content or concepts even after peer and/or adult help or does not attempt the written exercise.	The student explains basic content or concepts with or without peer or adult help but major errors are present.	The student explains basic content and concepts. Minor errors are present but do not detract from the overall response.	The student's explanation shows proficient understanding of basic content and concepts and applies new ideas to everyday life.