

Plasma Property

Overview:

Students replicate a model that demonstrates an important property of plasma: its ability to be affected by a magnetic force.

Objectives:

The student will:

- create a scientific model of plasma’s behavior when impacted by the magnetic force of Earth;
- compare a scientific model to the aurora phenomenon; and
- conclude that a property of plasma is its ability to be influenced by a magnetic force.

Materials:

- Safety glasses (one per student)
- Clear bottle with a cap (one per student/pair)
- Mineral oil
- Paper (one sheet per student/pair)
- Steel wool (without soap) or fine iron filings (one teaspoon per student/pair)
- Teaspoons (one per student/pair)
- Scissors (one per student/pair)
- Cow magnets (one per student/pair)
- STUDENT WORKSHEET: “Plasma Property”

Activity Procedure:

1. Explain that a scientific model is useful to help demonstrate or explain something that is difficult to show with the actual material. Students will examine a property of plasma. In science, a “property” is a quality of a substance. For example, a property of water is that it freezes at 0° C.
2. Distribute STUDENT WORKSHEET: “Plasma Property.” Review the worksheet. The activity on the sheet may be done individually or in pairs. Allow students to begin working on the activity. Do not distribute the cow magnets until students have finished step three of the procedure.
3. After students have completed the activity and worksheet, debrief by reviewing the activity, the analysis, and the conclusion.

Answers to Student Worksheet:

Analysis:

1. A. *electrons and ions in plasma or solar wind*
B. *Earth*
2. *magnetic field lines*

Conclusion:

Plasmas are influenced by magnetic forces.

Plasma Property

Directions: In plasma, atoms have been broken down into charged substances. Ions have a positive charge and consist of protons and neutrons. Electrons have a negative charge. Similar to a magnet, unlike charges attract each other and like charges repel each other. Perform the following activity to model the ability of ions and electrons to be influenced by a magnetic force.

Materials:

- Safety glasses
- Sheet of paper
- Clear bottle with a cap
- Mineral oil
- Steel wool or fine iron filings
- Teaspoon
- Scissors
- Cow magnet



Procedure:

1. Fill the bottle with mineral oil.
2. While wearing the safety glasses, cut up the steel wool into the tiniest particles possible over the sheet of paper. Make enough to fill the teaspoon.
3. Pour the steel wool particles into the bottle of oil by making a funnel out of the sheet of paper.
4. Place the cap on the bottle and shake until the particles are evenly distributed.
5. Slowly and briefly, hold the cow magnet up to the bottle.
6. On the diagram of the bottle above, draw the cow magnet and draw observations of the particles' behavior.

Analysis:

1. Compare the model to the aurora phenomenon.
 - A. What do the steel wool particles represent? _____
 - B. What does the magnet represent? _____
2. The steel wool particles align themselves along _____

Conclusion:

Complete the following statement:

This model represents the property of plasma. Plasmas are influenced by _____ forces.