Matter: In Four Acts

Overview:

By comparing structure and movement of substances within the four states of matter, students gain an understanding of the unique composition of plasma.

Objective:

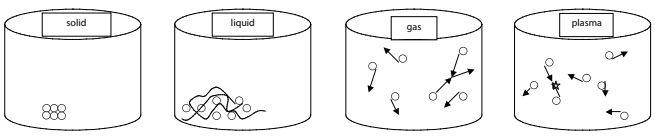
The student will differentiate states of matter by replicating and examining the structure and movement of molecules, atoms, and sub-atomic particles.

Materials:

- Markers
- Tape
- Flashlights
- STUDENT INFORMATION SHEETS: "Act 1," "Act 2," "Act 3," and "Act 4"
- STUDENT WORKSHEET: "Matter: In Four Acts"

Activity Procedure:

1. Inform students that this lesson focuses on the movement of molecules, atoms, and particles (ions and electrons) within the four states of matter. Their task is to carry out a dramatization of the movement and to observe others.
2. Organize students into groups of at least six to represent the movement and structure of the four states of matter. If there are not enough students, some may need to be part of more than one act.
3. Distribute the STUDENT INFORMATION SHEETS to each student according to group. Each group is to follow the instructions on the sheet. Give them five to ten minutes to organize themselves for the presentation.
4. Distribute STUDENT WORKSHEET: "Matter: In Four Acts." Review the directions. The stage, or presentation area, represents the container and the actors represent the contents of the container. Model how to denote an ion or electron by drawing a "+" or "—" within a circle.
5. Call upon each group to present their "act." Allow time for students to record any notes at the end.
6. Debrief this activity by discussing the observations and notes students recorded on the STUDENT WORKSHEET.



Answers to Student Worksheet:

States of matter do not have to be listed in any particular order. Notes or drawings should depict structure and movements corresponding to the appropriate state (see diagrams above). Possible answers:

Solid: organized molecules or atoms; vibrate or move very little

Liquid: atoms or molecules move slowly; slide around or move more than solid, less than gas

Gas: atoms or molecules move rapidly, bounce off of each other

Plasma: made of ions (+) and electrons (-); collisions release energy or light; move very fast; few atoms

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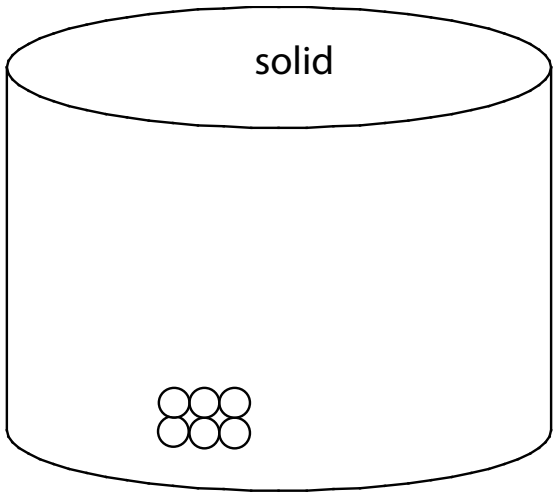
Act One

This group should represent atoms and molecules that display the following characteristics:

- Well-formed or organized structure;
- Atoms and/or molecules remain close together; and
- Atoms or molecules move very little (vibrate).

Props: Use markers, paper, and tape to write signs and attach to individuals representing "molecules" and "atoms."



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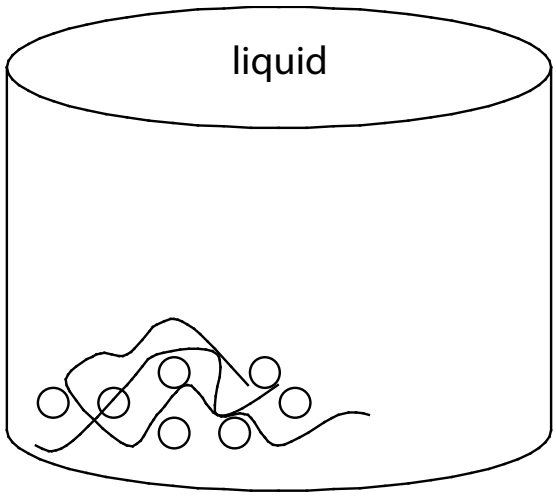
Act Two

This group should represent atoms and molecules that display the following characteristics:

- Atoms and/or molecules move freely around each other;
- Stay within an arm's reach; and
- Move slowly.

Props: Use markers, paper, and tape to write signs and attach to individuals representing "molecules" and "atoms."



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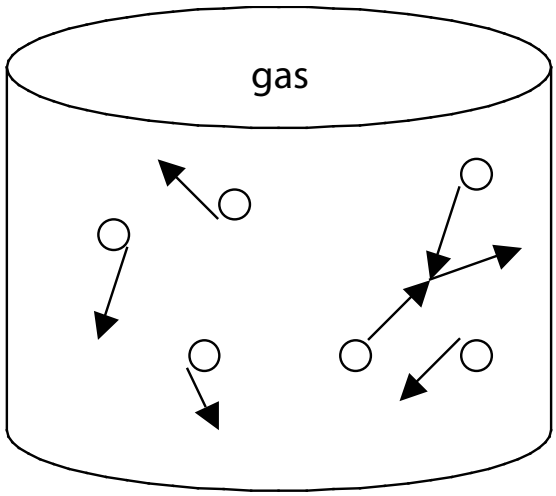
Act Three

This group should represent atoms and molecules that display the following characteristics:

- Atoms and/or molecules move freely all over;
- Move rapidly; and
- Bounce off each other when they collide.

Props: Use markers, paper, and tape to write signs and attach to individuals representing "molecules" and "atoms."



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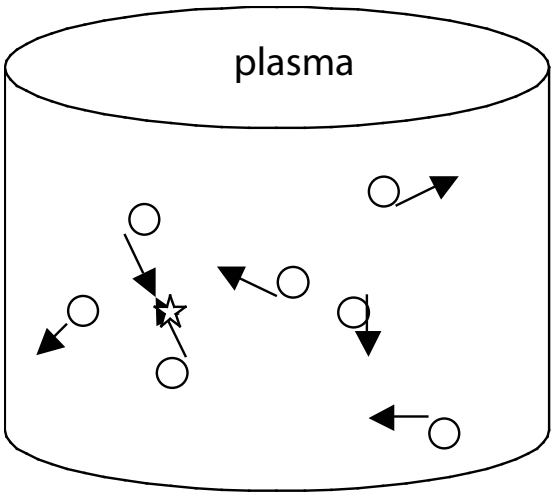
Act Four

This group should represent ions (+) and electrons (-) that display the following characteristics:

- Ions and electrons move freely all over (with few atoms);
- Move rapidly; and
- Collisions release energy.

Props: Use markers, paper, and tape to write signs and attach to individuals representing "ions (+)" and "electrons (-)" with one person representing an "atom." Use flashlights to model energy release during collisions.



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Name: _____ **Student Worksheet**

Matter: In Four Acts

Directions: Observe the movements of the four "acts." Draw circles in the containers below to represent the molecules, atoms, or particles; draw arrows to represent movement that characterizes the four states of matter. Label each square as solid, liquid, gas, or plasma. Record notes in the lines below.

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