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### Student Exploration: Ionic Bonds

**Directions:** Follow the instructions to go through the simulation. Respond to the questions and prompts in the orange boxes.

**Vocabulary:** chemical family, electron affinity, ion, ionic bond, metal, nonmetal, octet rule, shell, valence electron

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. Nate and Clara are drawing pictures with markers. There are 8 markers in a set. Nate has 9 markers and Clara has 7. What can Nate and Clara do so that each of them has a full set?


Give one marker to Clara

2. Maggie is sitting at a table with Fred and Florence. Maggie has 10 markers, but Fred and Florence each have only 7 markers. How can they share markers so each has 8?

Maggie can give 1 marker to Fred, and one marker to Florence

### Game Warm-up

Just like students sharing markers, atoms sometimes share or swap electrons. By doing this, atoms form bonds. The **Ionic Bonds Gizmo** allows you to explore how **ionic bonds** form.

To begin, check that **Sodium (Na)** and **Chlorine (Cl)** are selected from the menus at right. Click **Play** (  ) to see electrons orbiting the nucleus of each atom. (Note: These atom models are simplified and not meant to be realistic.)



1. Each atom consists of a central nucleus and several **shells** that contain electrons. The outermost electrons are called **valence electrons**. (Inner electrons are not shown.)

How many valence electrons does each atom have?

**Sodium:**

1

### Chlorine:

1

2. Click **Pause** (). Elements can be classified as **metals** and **nonmetals**. Metals do not hold on to their valence electrons very tightly, while nonmetals hold their electrons tightly. **Electron affinity** is a measure of how tightly the valence electrons are held.

- A. Try pulling an electron away from each atom. Based on this experiment, which atom is a metal?

## Sodium

Which is a nonmetal?

Chlorine

- B. Try moving an electron from the metal to the nonmetal. What happens?

Sodium's electron is transferred to Chlorine's outer ring of electrons.

# Ionic Bond Gizmo

**Minjie Lin**

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the author's name.

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