

## INSPIRE GK12 Lesson Plan



<b>Lesson Title</b>	Chemical Bonding
<b>Length of Lesson</b>	2 Days
<b>Created By</b>	Hannah Box
<b>Subject</b>	Physical Science
<b>Grade Level</b>	8th
<b>State Standards</b>	Eighth Grade: 2a & 2b
<b>DOK Level</b>	DOK 1 & DOK 2
<b>DOK Application</b>	Recognize, Name, Label, Recall, Identify Patterns, Categorize, Classify, Relate
<b>National Standards</b>	5-8: B: Physical Science
<b>Graduate Research Element</b>	Chemical Bond Formation

### **Student Learning Goal:**

#### State Standards Eighth Grade:

2a: Identify patterns found in chemical symbols, formulas, reactions, and equations that apply to the law of conservation of mass. (DOK 1)

2b: Predict the properties and interactions of given elements using the periodic table of the elements. (DOK 2)

#### National Standards 5-8: B: Physical Science:

Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances often are placed in categories or groups if they react in similar ways; metals is an example of such a group.

### **Materials Needed (supplies, hand-outs, resources):**

Power point for bonding basics and small assessment. Marbles (different colors would be better) and 2 egg cartons per group.

### **Lesson Performance Task/Assessment:**

The students will be asked to answer questions as the material is being covered. The students will be asked to work alone and their papers will be taken up for a grade.

On day two, students will work in small groups to complete a bonding exercise and complete a data and observation sheet.

### **Lesson Relevance to Performance Task and Students:**



The questions that students will have to answer will be asked directly after covering the material. This is done in hopes of helping the students to better understand the material by application.

The activity will serve as a visual example of what is happening to electrons in ionic and covalent bond formation.

**Anticipatory Set/Capture Interest:**

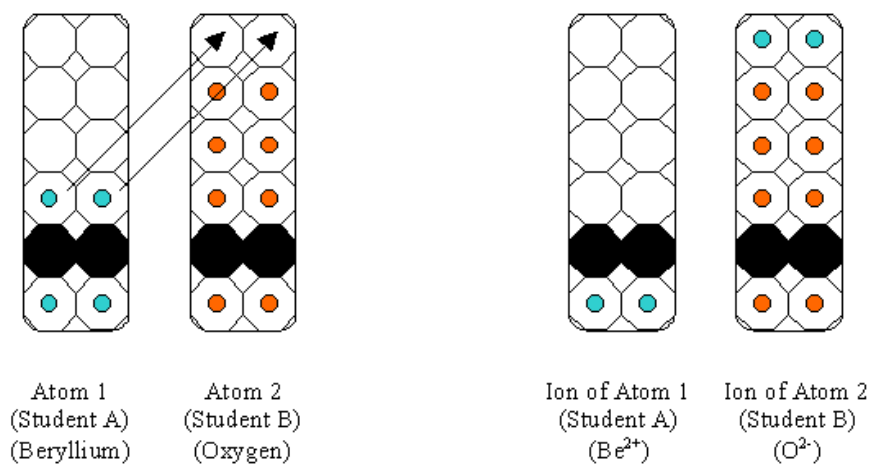
Use software to generate 3D representations of common chemicals that the students would encounter.

**Guided Practice:**

On the first day of this lesson, the teacher will cover the basics of bonding. Attached to this lesson is a power point that covers bonding and has questions throughout to serve as miniature assessments as the material is covered.

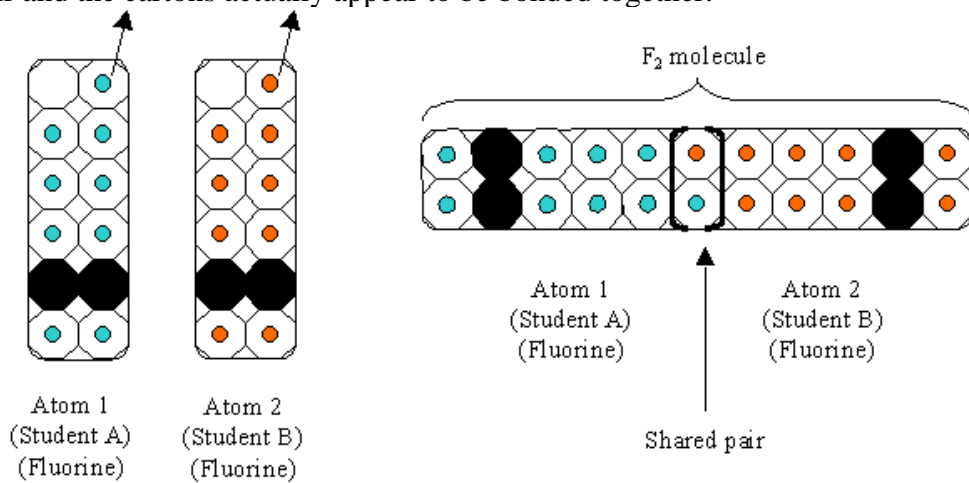
Day two will consist of an activity, which will allow students to apply the knowledge they obtained on the previous day. The teacher will provide each group of students with two egg cartons (one dozen). They should remain closed and be labeled as one and two.

For the first part of the activity, ionic bonding, the teacher will take an egg carton and place black paper over the second set of holes. This will represent the energy levels in an atom. The teacher will choose ionic compounds such as HCl and put seven marbles (electrons) in one carton and then one in another carton. Spread the partnering atoms out throughout the groups. The teacher will then explain to the students that the outermost energy level that is represented by the carton is not full. The atoms will want to find some electrons to help make them more stable. At this point the students will be asked to decide what needs to happen to make their atom more stable. Knowing that the energy level will be stable with eight electrons, ask the students what would be easier for their atom to do in order to achieve this stability (less moving of electrons). Once they have decided what they need to do in order to be stable have them go to the other groups to find the group that they should partner with. Once the students find their partners, they should bring their atoms together and make the electron switch in order to make both atoms stable, and then they should stick together as a pair. An example is shown below of how the carton would be set up.



The students should then look at the periodic table and identify the elements that they were given and which column and family they belong to. They should do the same for the element that they were partnered with. Have the students identify the type of bonding that is taking place.

Now for the second part of this activity, the students will do the same thing but for covalent bonding. The students will all have the same element for this part of the activity because it is a harder concept. Fluorine is the best example to use because it has only one shared electron. Each group will represent one fluorine atom so have them partner with another group so that there are two atoms to a group. Ask them if there is a way to give and take electrons so that both atoms can be stable. After thinking this question over, the students should realize that there is no way for the atoms to be stable unless they share an electron. The teacher will ask the students to remove the last unpaired marble from the carton and stack the last the last row of their egg cartons together. Students will then place the two marbles back into the empty positions. This represents the shared electron pair and the cartons actually appear to be bonded together.





**Independent Practice:**

As the teacher is going through the power point, the students will have to answer questions on the material as it is covered.

At the end of the lecture there is a chance for the students to answer some bonus questions. These questions will require higher-level thinking and transfer from other subject areas such as English.

**Remediation and/or Enrichment:**

Remediation: Individual IEP. The teacher could go through the questions with the class after giving them a moment to think about their answers.

Enrichment: Ask the students to repeat part two of the activity with another element that could involve double or triple bond formation.

**Check(s) for Understanding:**

Throughout the power point, students will be asked to answer questions as the material is being covered.

The students will then have to complete an activity on chemical bonding.

- What are some analogies for the types of bonding we have covered so far? (Ionic, Covalent, and Metallic)
- From what we have learned about bonding, have you noticed a pattern in the periodic table groups that is associated with the types of bonds formed?

For homework, each student will be assigned an element from the periodic table and asked to research the element and how it bonds.

**Closure:**

Students will have a better understanding of what is meant when we say that atoms make up all matter.

Students will be able to understand the movement and sharing of electrons in ionic and covalent bonds.

**Possible Alternate Subject Integrations:**

## INSPIRE GK12 Lesson Plan



Chemistry: This lesson could serve as a review of basic bonding before learning more complex ideas such as network covalent solid and crystal structures.

### **Teacher Notes:**

3D software used is a program called Mercury. It is a free download from the Internet.

Power point is attached to lesson plan

Activity was taken from:

<http://galileo.phys.virginia.edu/outreach/8thGradeSOL/BondingFrm.htm>