Science Objectives

- Students will transfer electrons from a metal to a nonmetal.
- Students will relate this transfer to the formation of positive and negative ions.
- Student will learn how to write formulas for ionic compounds.

Vocabulary

- anion
- atom
- cation
- electron
- ion
- ionic compound
- metal
- nonmetal
- octet
- redox reaction
- salt

About the Lesson

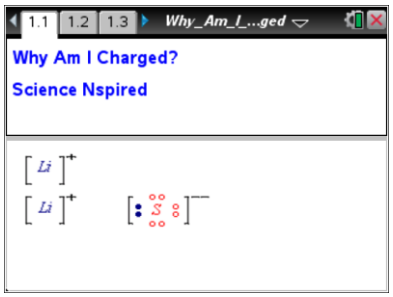
- This simulation gives a macroscopic view of what occurs microscopically when a metal and a nonmetal react.
- As a result, students will:
  - Better understand how ions are formed.
  - Be able to write formulas for ionic compounds.

TI-Nspire™ Navigator™

- Send out the *Why_Am_I_Charged.tns* file.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

Activity Materials

- Compatible TI Technologies: TI- Nspire™ CX Handhelds, TI-Nspire™ Apps for iPad®, TI-Nspire™ Software



Tech Tips:

- This activity includes screen captures taken from the TI-Nspire CX handheld. It is also appropriate for use with the TI-Nspire family of products including TI-Nspire software and TI-Nspire App. Slight variations to these directions may be required if using other technologies besides the handheld.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials

Lesson Files:

Student Activity

- Why_Am_I_Charged_Student.doc
- Why_Am_I_Charged_Student.pdf

TI-Nspire document

- Why_Am_I_Charged.tns

Discussion Points and Possible Answers

Move to pages 1.2 – 1.6.

Have students answer the questions on pages 1.2 to 1.6 before moving on to Problem 2. You can have them answer the questions on either the device, on the activity sheet, or both.

Q1. Atoms of an element are _____ charged.

Answer: C. neutrally

Q2. Metals have _____ electron(s) in their outer electron shell.

Answer: D. one, two, or three

Q3. Negatively charged ions are called _____.

Answer: A. anions

Q4. The transfer of electrons between a metal and a nonmetal is an example of a _____.

Answer: D. redox reaction

Q5. The loss and gain of electrons in a redox reaction must be _____.

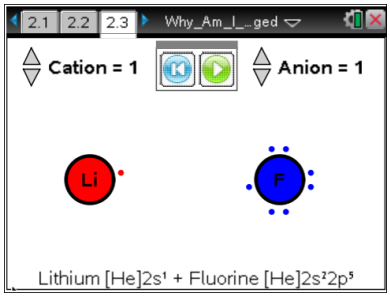
Answer: C. equal and simultaneous

TI-Nspire Navigator Opportunities

To quickly assess student understanding, use Quick Poll to gather answers to any of the questions through the lesson.

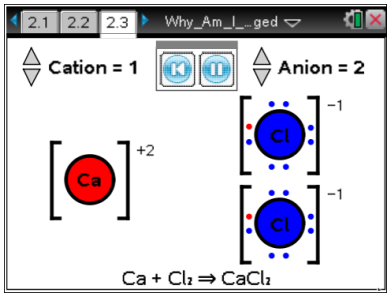
Move to pages 2.1 and 2.2.

1. Students will have a combination of a metal and a nonmetal. They need to decide how many metal atoms are needed and adjust **Cation** to reflect that choice.
2. Students then must decide how many nonmetal atoms are needed and adjust **Anion** to reflect that choice. The maximum value of each (for this simulation) is 2. Next the students will select **Play** (green arrow) to observe the electrons being transferred.

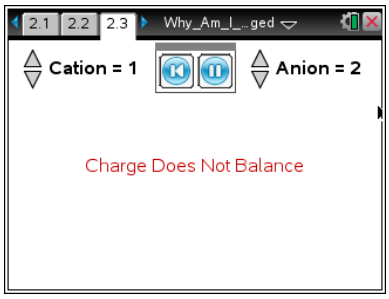


Move to page 2.3.

3. The students will then determine whether the loss and gain of electrons was equal.



4. If not, the students will readjust either **Cation** and/or **Anion**. The students will repeat this process until all 10 possible electrons transfers have been successfully completed.
5. Students may need help understanding the connection between the formulas at the bottom of the screen and what is happening with the transfer of electrons in the simulation window. You may want to do the first one together as a demo so they know that they have a correct combination when there is a valid chemical formula for the compound.



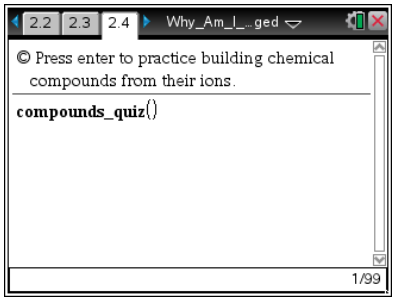
Tech Tip: To work on a new problem, select **Menu** or > **Why Am I Charged > New Pair of Ions.** You may need to back-out to the main Tools Menu to see the desired menu option.

TI-Nspire Navigator Opportunities

You can make one student the Live Presenter and allow them to demonstrate a transfer of electrons. This could allow other students to see how to use the simulation.

Move to page 2.4.

6. Students take a quiz on page 2.4 in which they write the formula of a cation, an anion, then a compound. Remind them that ions **MUST** have a charge, but they do not need a number if the charge is 1– or 1+. Encourage students to complete 5 compounds successfully.



Tech Tip: To start the quiz, students can double-tap anywhere on the screen. The keyboard will appear. Students should select enter and follow the prompts. To input values during the quiz, they will tap the input box. The keyboard will appear. To enter a numerical value, students should select the button **".?123"** located to the left or right of the space bar. To enter a + or – symbol, students should select the button **"#+=,"** enter the appropriate symbol, and then select enter.

Move to pages 3.1 – 3.10.

Have students answer the questions on either the device, on the activity sheet, or both.

Q6. When sodium reacts with chlorine, _____sodium atom(s) react(s) with _____chlorine atom(s).

Answer: D. one, one

Q7. When lithium loses an electron to a nonmetal, it gains a _____ charge.

Answer: D. positive

Q8. Fluorine is a diatomic molecule. When F_2 reacts to make two fluoride ions, there must be a total of _____ electrons gained.

Answer: C. two

Q9. Barium reacts with sulfur in a _____ ratio.

Answer: B. 1:1

Q10. The reaction of lithium with sulfur requires the transfer of _____ electron(s).

Answer: B. two

Q11. The reaction of sodium and oxygen requires _____ atom(s) of sodium to react with one atom of oxygen.

Answer: B. two

Q12. The reaction of barium and fluorine requires _____ fluorine atom(s).

Answer: C. two

Q13. Table salt consists of a _____ ion and a _____ ion.

Answer: D. sodium, chloride

Q14. What holds sodium chloride together?

Answer: The attraction of the positive ions for the negative ions holds the compound together.

Q15. Why does salt water conduct electricity?

Answer: Salt water conducts electricity because the positive and negative ions are able to carry charge and complete the electric circuit.

TI-Nspire Navigator Opportunities

Use TI-Nspire Navigator to capture screen shots of student progress and to retrieve the file from each student at the end of the class period. The student questions can be electronically graded and added to the student portfolio.

Wrap Up

When students are finished with the activity, pull back the .tns file using TI-Nspire Navigator. Save grades to Portfolio. Discuss activity questions using Slide Show.

Assessment

- Formative assessment will consist of questions embedded in the .tns file. The questions will be graded when the .tns file is retrieved by TI-Nspire Navigator. The TI-Nspire Navigator Slide Show can be utilized to give students immediate feedback on their assessment.
- Summative assessment will consist of questions/problems on the chapter test, inquiry project, performance assessment, or an application/elaborate activity.

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