

Key: Yellow highlight = required component

Zeros all Around

Number and Operations

Associated Unit: Number Systems

Seventh Grade

1 of 1 **50 minutes (1 class)**

Summary

The teacher will engage their learners in reflective and collaborative work that will have them represent zero using atoms and MnMs. Students will begin class by accessing prior knowledge using a KWL chart. Using this knowledge they will be given a challenge question about representing zero using their MnMs and a print out of Figure 2 as a skeleton to work off. The class will use a think-pair-share model, when doing their work, to promote collaboration. To close out the lesson, students can answer questions about atom charges and other real life examples of additive inverses. After the lesson students will return to their KWL charts to fill in their learning section. For the summative assessment, students will answer a long response and a short response questions. Homework will give students a chance to spend time thinking about how this topic can be found in their every day life, by asking them to find situation that have additive inverses.

Engineering Connection

Solving for Equilibrium

Identifying Atom charge to determine how elements interact with one another.

Engineering Category = 1

Choose the category that best describes this lesson's amount/depth of engineering content:

1. Relating science and/or math concept(s) to engineering

Keywords

Number Systems, atom charges,

Educational Standards

State STEM Standard

<http://www.fldoe.org/core/fileparse.php/5390/urlt/0081015-mathfs.pdf> , 2010, MAFS.7.NS.1.1, 7th Grade, Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

NGSS Standard

[http://www.nextgenscience.org/search-performance-expectations?tid_2\[\]=14](http://www.nextgenscience.org/search-performance-expectations?tid_2[]=14) , 2013, MS-PS1-1, 6th-8th Grade, Develop models to describe the atomic composition of simple molecules and extended structures.

CCSS Standard

<http://www.corestandards.org/Math/Content/7/NS/> , 2008 ,CCSS.MATH.Standards.7.NS.A.1.A, 7th Grade, Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

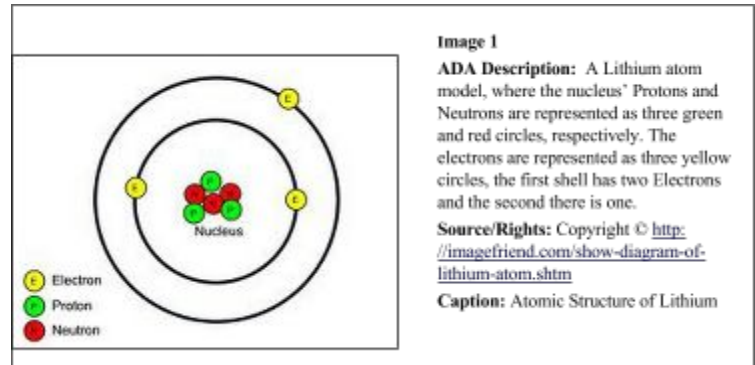


Image 1

ADA Description: A Lithium atom model, where the nucleus' Protons and Neutrons are represented as three green and red circles, respectively. The electrons are represented as three yellow circles, the first shell has two Electrons and the second there is one.

Source/Rights: Copyright © <http://imagefriend.com/show-diagram-of-lithium-atom.shtml>

Caption: Atomic Structure of Lithium

Pre-Requisite Knowledge

CCSS.MATH.CONTENT.6.NS.C.5

Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

Learning Objectives

After this lesson, students should be able to:

- Identify and explain how situations can represent zero.

Introduction / Motivation (5E – Engage)

- Students will be given an overarching question: Using up to 9 MnM's, of only two colors, how can we represent zero without consuming them?
- Use a Think-pair-share model to promote collaboration.
- Using student representations to promote discussion.

Lesson Background & Concepts for Teachers (5E – Explain)

- Teachers should be able to read and describe a Period table and the Bohr's model, like in figure 2, of an atoms.
- Teachers should spend a short time ensuring students have some knowledge of atoms and vocabulary.
- How an atom acquires its charge, from the sum of the number of protons and electrons that it has.
- Teacher should be able to describe examples and non examples which yield zero.

Vocabulary / Definitions

Word	Definition
Atom	The smallest component of an element
Proton	An elemental particle with a positive charge.
Electron	An elemental particle with a negative charge.
Neutron	An elemental particle with no charge
Additive Inverse	Two Numbers, in the set of real numbers, when added yield zero
Integers	Whole numbers and their opposites

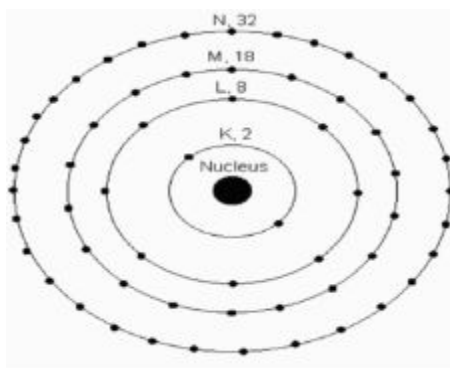


Figure 2

ADA Description: This is a black and white Bohr model of an atom up to level N and the electron configurations.

Source/Rights: Copyright © www.tulane.edu

Caption: Figure 2. This image can be used as a frame for the small groups to set up their atoms.

Associated Activities (5E – Explore)

- Teacher will give students up to 5 minutes to think through the question and work with a Hydrogen atom as the first real life context. Another 5 minutes dedicated to listening to student's ideas.
- Using think-pair-share structure, students will pick one atom to represent if it had zero charge, pair up with a partner with the same element, share their structures with the teacher/class/other group. (10 minutes)
- During the Share portion of the Think-Pair-Share of the exercises, students will get a chance to explain the process their group used to build their element and what each piece represents in the model. (2-3 minutes)

Lesson Closure

- Teacher can close the lesson with a couple questions to assess students learning for the day using Quick Responses like Plicker or a slip of paper as an Exit Ticket. (5 minutes)
- Questions
 - Other real life example that equal zero?
 - If we had an atom with 3 protons how many Electrons would it need to have a charge of zero, what about 230 Protons?
 - Give me two integers who's sum is zero

Assessment (5E – Evaluate)

Pre-Lesson Assessment

Descriptive Title: KWL Chart Attachment page six. (5 minutes)

1. For Pre-assessment students should begin a KWL focused around multiple topics or chunked, this graphical organizers will allow the students to activate prior knowledge and record their understanding. For the teacher this gives them the opportunity to review the student's understanding to better prepare for instruction. When using the KWL chart for the diagnostic assessment only fill in the K and W, the L column can be used for Post instruction assessment.
 - a. Vocabulary
 - b. Simple computations: $-2+2 = x$, $y+7=0$, $3+(-3)=z$
 - c. The three components of an atom

Post-Introduction Assessment

Descriptive Title: KWL Chart. (5 minutes)

1. To make the post-assessment comparable to the pre-assessment, have student finish the L column in their concept chart. By using the KWL chart, this gives students the chance to reflect and put their new ideas on paper. While giving teachers an easy glimpse at student's progress from the initial assessment.

Lesson Summary Assessment

Descriptive Title: ____? (5 minutes)

1. Describe a situation, discussed in class or not, when two quantities combine to make zero (illustrations are encouraged)

2. Does the image show an atom that has charge of zero?

Homework

Descriptive Title: Zero All Around H.W.

1. Describe and illustrate two situation during your day that represent zero.

Lesson Extension Activities (5E – Extension)

- Have students brainstorm other example in real life that can represent two quantities making combining to zero.
 - Start the extension by giving one example of when two real life examples. For example, an apple representing 5 bites, and each bite representing negative one, after 5 bites, there is zero apple/bites left.
 - Second second example can be done as a whole class. Have the students come up with a situation and when it can represent positives and negatives. This can emphasize the goal and give the students confidence when it is their turn to do it in groups.
 - Third, in small groups students can come up with their own scenarios to present to the class. Allow the students the chance to discuss the practicality of these scenarios. Ask follow up questions such as, what makes this part of the situation negative or positive, how did you know to assign it a negative or positive sign, what kind of words let us know it's negative or positive. When an issue is found as a class discuss how to correct and why it wasn't correct.

References

Vocabulary - Dictionary.com

<http://imagefriend.com/show-diagram-of-lithium-atom.shtm>

www.tulane.edu

<http://www.corestandards.org/Math/Content/7/NS>

[http://www.nextgenscience.org/search-performance-expectations?tid_2\[\]=14](http://www.nextgenscience.org/search-performance-expectations?tid_2[]=14)

<http://www.fldoe.org/core/fileparse.php/5390/urlt/0081015-mathfs.pdf>

Attachments

Pre & Post Assessment - KWL Chart Attachment

Contributors

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Supporting Program

USF – Research Experiences for Teachers (RET)

Attachments

Pre & Post Assessment - KWL Chart Attachment

Parts of an Atom: Protons; Neutron's; Electrons		
Know	Want to Learn	Learned

Representing Zero		
Know	Want to Learn	Learned

Home Work - Zero All Around H.W.

If you haven't noticed, zero is represented in your everyday life. For this homework, spend some time thinking about your day and how the quantity zero can be represented. Using the space below **described and illustrate two** scenarios. Be sure to explain what part of the example is negative and positive, and how much of each is needed to make zero.