



### Science Objectives

- Students will learn how certain properties of the elements tend toward a periodic similarity when the elements are arranged in order of increasing atomic number.
- Students will note the intervals between similarities and the relationship between similar elements.

### Vocabulary

- atomic mass
- atomic number
- ionization energy
- Periodic Law
- periodic table
- $Z$
- $Z_{\text{eff}}$

### About the Lesson




- This lesson involves the periodic trends of certain properties of atoms
- As a result, students will:
  - Graph pertinent data and observe the trends that occur.
  - Answer questions to demonstrate their understanding of the periodic trends.
  - Learn the Periodic Law.

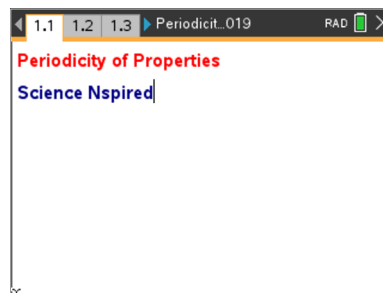


### TI-Nspire™ Navigator™

- Send *Periodicity\_of\_Properties.tns* file to students.
- Use class capture to monitor student progress.
- Collect and grade *Periodicity\_of\_Properties.tns* file
- Use slide show to review student work.

### 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

- Periodicity\_of\_Properties\_Student.pdf
- Periodicity\_of\_Properties\_Student.doc

#### TI-Nspire document

- Periodicity\_of\_Properties.tns

## Discussion Points and Possible Answers

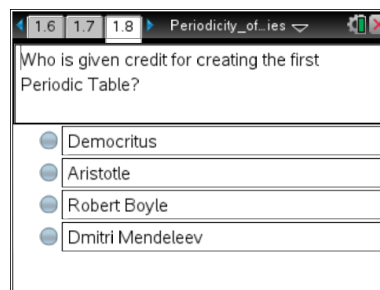
### Move to pages 1.2.-1.7

Page 1.2 contains an interactive Periodic Table for students to use in this activity. Pages 1.3-1.7 contain background information on the structure of the table.

### Move to page 1.8.

1. Who is given credit for creating the first Periodic Table?

**Answer:** Dmitri Mendeleev



### Move to page 1.9.

2. The first Periodic Table was arranged by \_\_\_\_\_.

**Answer:** increasing atomic mass

### Move to page 1.10.

3. Who rearranged the Periodic Table into its current order?

**Answer:** Henry Moseley

### Move to page 1.11.

4. When the element are arranged in order of increasing atomic number, similarities of properties \_\_\_\_\_.

**Answer:** occur periodically

### Move to page 2.3.

5. The atomic trends in the Lists & Spreadsheets page \_\_\_\_\_.

**Answer:** repeat in a periodic fashion



**Move to page 2.6.**

6. The relationship between atomic mass and atomic number is \_\_\_\_\_.

**Answer:** direct

**Move to page 2.7.**

7. The atomic mass increases as the atomic number increases because of the addition of \_\_\_\_\_.

**Answer:** protons and neutrons

**Move to page 3.3.**

8. There are no electronegativity values for elements 2, 10, 18, 36, and 54 because they are \_\_\_\_\_.

**Answer:** practically inert

**Move to page 3.4.**

9. Locate the 'peaks' on the graph. The elements that are found on the peaks are part of what group on the Periodic Table?

**Answer:** halogens

**Move to page 3.5.**

10. These elements have the highest electronegativity values because they have \_\_\_\_\_.

**Answer:** greater  $Z_{\text{eff}}$  (effective nuclear charge)

**Move to page 3.6.**

11. What elements are found in the 'valleys' of the graph?

**Answer:** alkali metals



Move to page 3.7.

12. Why would these elements have the lowest electronegativity values?

**Answer:** low  $Z_{\text{eff}}$  (effective nuclear charge)

Move to page 3.8.

13. What happens to the electronegativity values as you go down a group?

**Answer:** decrease

Move to page 3.9.

14. What causes the trend from the previous question?

**Answer:** decreasing  $Z_{\text{eff}}$

Move to page 3.10.

15. If this graph were turned one quarter turn clockwise, the pattern would mimic \_\_\_\_\_.

**Answer:** the Periodic Table

Move to page 4.2.



**Tech Tip:** Students may need to scroll down through the list of variables to find **firstioniz**. After selecting the  $y$ -axis, they can select any location within the list of variables and scroll through the list.

Move to page 4.3.

16. The peaks on this graph are elements from what group of elements?

**Answer:** noble gases



Move to page 4.4.

17. This group of elements have the highest first ionization energy because they have the largest

\_\_\_\_\_.

**Answer:**  $Z_{\text{eff}}$

Move to page 4.5.

18. The elements found in the valleys on this graph represent what group of elements?

**Answer:** alkali metals

Move to page 4.6.

19. This group of elements has the smallest ionization energy because they have the smallest

\_\_\_\_\_.

**Answer:**  $Z_{\text{eff}}$

Move to page 4.7.

20. As you move across a period from left to right, the first ionization energy \_\_\_\_\_.

**Answer:** increases

Move to page 4.8.

21. This trend occurs because of increasing \_\_\_\_\_.

**Answer:**  $Z_{\text{eff}}$

Move to page 4.9.

22. As you go down a group, the ionization energy \_\_\_\_\_.

**Answer:** decreases



Move to page 4.10.

23. This trend occurs because the electrons are farther from the nucleus causing  $Z_{\text{eff}}$  to \_\_\_\_\_.

**Answer:** decrease

Move to page 5.1.

24. The relationships observed in this activity were not evident until 1913 because of the work of \_\_\_\_\_.

**Answer:** Moseley

Move to page 5.2.

25. In 1913, the Periodic Table was rearranged in order of increasing \_\_\_\_\_.

**Answer:** atomic number

Move to page 5.3.

26. From studying the graphs of various periodic properties versus the atomic number, it can be stated that these properties \_\_\_\_\_.

**Answer:** repeat periodically

**TI-Nspire Navigator Opportunity**

Use the TI-Nspire Navigator to collect, grade, and save the .tns files to the Portfolio. Use Slide Show to view student responses.

**Wrap Up**

Upon completion of the discussion, the teacher should ensure that students are able to understand:

- How to use the TI-Nspire technology.
- How to manipulate data in the Data & Statistics App to observe trends on the Periodic Table.
- The various trends of periodic data.

**Assessment**

Students will complete the embedded multiple choice questions in the *Periodicity\_of\_Properties.tns* file.