



Science Objectives

- Students will observe the electron configuration of atoms and discover the relationship between the electron configuration and the position of an element in the Periodic Table.
- Students will understand why elements in a group have similar chemical properties.
- Students will relate metallic and nonmetallic elements to electron configuration.

Vocabulary

- | | |
|--------------------------|--------------------|
| • atomic number | • octet rule |
| • electron configuration | • period and group |
| • metal and nonmetal | • periodic table |
| • noble gas | • shells |

About the Lesson




- The importance of the shell model of the atom is highlighted in this lesson.
- This lesson features an interactive periodic table. Students use sliders to move around the table. The electron configuration of the element is displayed graphically. The electron configuration is also displayed in the standard textual form.
- As a result, students will have a better understanding of the relationship between electron configuration:
 - and the form of the periodic table,
 - noble gases,
 - and metals and non-metals.

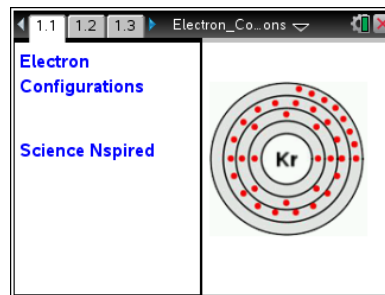


TI-Nspire™ Navigator™

- Send out the *Electon_Configurations.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

- Electron_Configurations_Student.doc
- Electron_Configurations_Student.pdf

TI-Nspire document

- Electron_Configurations.tns



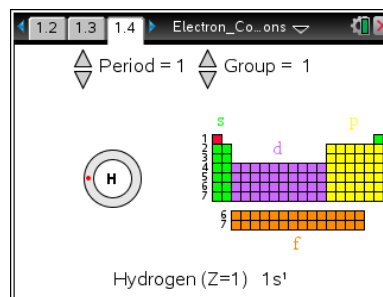
Discussion Points and Possible Answers

Move to pages 1.2 and 1.3.

Students should read the introduction and directions on page 1.2 and 1.3.

Move to page 1.4.

1. Students will use the interactive periodic table on page 1.4 to investigate periodic properties. They will use the two sliders or the left and right arrows to move through the periods and groups in the Periodic Table, observing how electron configurations relate to the number of electrons in the atom and the location of each element in the periodic table.



Tech Tip: Region *f* on the Periodic Table can be accessed by setting the period to 6 or 7 and then setting the group number to 3.



TI-Nspire Navigator Opportunities

Make a student a Live Presenter and have the student demonstrate (1) how electrons are added to new shells as the period changes, (2) elements in the same group have the same number of electrons in the outer shell. You may want to have students notice (1) the special nature of the noble gas electron configurations and (2) how the number of columns changes with period. This will enhance the class discussion of the structure of the Periodic Table.

Move to pages 1.5–1.22.

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

- Q1. The 5th element (atomic number 5) in the Periodic Table is in period 2 and group 3. What is this element?

Answer: B. Boron

- Q2. Carbon has atomic number 6.

Carbon (C) 6 ► [He] $2s^2 2p^2$

How many electrons does a neutral carbon atom have?

Answer: C. 6



- Q3. The total number of electrons in any neutral atom of any element is the same as the atomic number for that element.

Answer: A. True

- Q4. The number of electron shells is equal to _____.

Answer: A. the period number

- Q5. What is the maximum number of electrons in the first shell?

Answer: A. 2

- Q6. What is the maximum number of electrons in the second shell?

Answer: C. 8

- Q7. What is the maximum number of electrons in the third shell?

Answer: D. 18

- Q8. The number of electrons in each shell follows a pattern: 2, 8, 18... . What is the mathematical rule for this pattern, in terms of the shell number n ? (HINT: Try first dividing the numbers above by 2.)

Answer: D. $2n^2$

- Q9. Sodium (Na, 11) has electron configuration 2, 8, 1. This indicates that the number of electrons in its outer shell is:

Answer: A. 1

- Q10. Two elements with one electron in their outer shells are:

Answer: C. Lithium and Potassium

- Q11. Elements in the same column have the same number of _____.

Answer: D. outer electrons



Move to page 1.17.

Elements with 8 electrons ($ns^2 np^6$) in the outer shell (**an octet**), or 2 electrons ($1s^2$) in the case of helium, are generally stable and unreactive. These elements are known as **noble gases**.

Q12. Which of the following are noble gases? (List all that apply.)

Answers: B. Helium, C. Neon, and D. Argon

Move to page 1.19.

Elements such as Sodium, Potassium and Zinc, which have a small number of electrons in their outer shell, are classified as **metals**. Metals generally have 4 or less electrons in the outer shell.

Chlorine (2, 8, 7) and Oxygen (2, 6), which have close to an octet of electrons in the outer shell, are classified as **non-metals**.

Q13. Non-metals are generally found on the left side of the Periodic Table.

Answer: B. False

Q14. To satisfy the “octet rule”, a non-metal such as Oxygen (2, 6) needs to **gain** electrons. A metal such as Magnesium (2, 8, 2) needs to **lose** electrons. When magnesium burns in air, the two elements exchange electrons to form a stable compound. How many electrons does each need to gain or lose?

Answer: D. Magnesium loses 2; Oxygen gains 2

Q15. Silicon (2, 8, 4) has some properties of metals and some of non-metals. This is because it has about half the number of electrons required for an octet and so may gain or lose electrons.

Another such element is _____.

Answer: B. Arsenic



TI-Nspire Navigator Opportunities

If students answer the questions within the .tns file, the files can be collected at the end of class and graded electronically and added to the 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.