8

DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Science

Quarter 2
Lesson
6

Lesson Exemplar for Science Grade 8
Quarter 2: Lesson 6 of 6 (Week 8)
SY 2025-2026

Development Team

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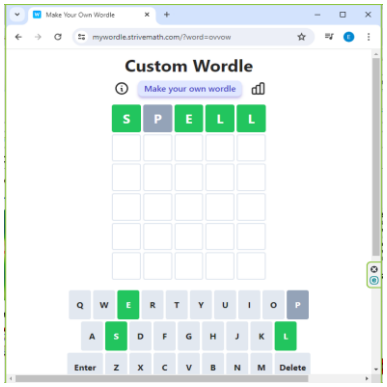
SCIENCE / QUARTER 2 / GRADE 8

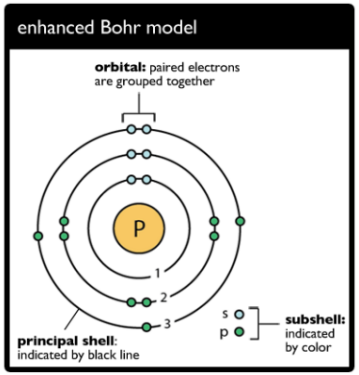
I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners learn that: 1. The use of timeline and charts can illustrate scientific knowledge of the structure of the atom has evolved over time. 2. The current structure of the atom includes subatomic particles, their symbol, mass, charge, and location. 3. Elements and compounds are identified as pure substances. 4. The periodic table is a useful tool to determine the chemical properties of elements.
B. Performance Standards	By the end of the Quarter, learners demonstrate an understanding of the structure of the atom and how our understandings have changed over time. They draw models of the atom and use tables to represent the properties of subatomic particles. They demonstrate their knowledge and understanding of the periodic table by identifying the elements, their symbols, their valence electrons, and their positions within the groups and periods. They design and/or create timelines or documentaries as interesting learning tools.
C. Learning Competencies and Objectives	***Learning Competency*** 1. *explain that the electron structure of an atom determines its position on the periodic table; and* 2. *explain that the elements within a group in the periodic table have the same number of valence electrons.* ***Learning Objectives*** 1. *draw the graphical illustration of valence electrons of specified elements;* 2. *explain how elements were arranged according to blocks; and* 3. *explain the similarities of elements within the same group.*
D. Content	The following topics will be discussed: 1. electron dot diagrams; 2. blocks in the periodic table; and 3. groups and similar properties.
E. Integration	Integration of identified Sustainable Development Goals related issues or information SDG 6, 12, 14, and 15.

II. LEARNING RESOURCES
EarthPen. (2021, August 3). SPDF Block Elements | Chemistry Animation [Video]. YouTube. https://www.youtube.com/watch?v=N0eGOxzlFEw

Features of the Groups and Periodic trends in properties — lesson. Science State Board, Class 10. (n.d.). https://www.yaclass.in/p/science-state-board/class-10/periodic-classifications-of-elements-11437/the-modern-periodic-law-10971/re-849b482b-1887-4588-96ee-e6a3c8f75ad5
Fig. 1 Sources of trace elements in the environment, bioaccumulation. (n.d.). ResearchGate. https://www.researchgate.net/figure/Sources-of-trace-elements-in-the-environment-bioaccumulation-biomagnification-and_fig3_319647424
File:Enhanced Bohr models.png - Wikimedia Commons. (2019, February 8). https://commons.wikimedia.org/wiki/File:Enhanced_Bohr_models.png
File:Oxygen and electrons.svg - Wikimedia Commons. (2008, February 16). https://commons.wikimedia.org/wiki/File:Oxygen_and_electrons.svg
Identify each block in the blank periodic table.(a) s block(b) p block(c) d block(d) f | StudySoup. (n.d.). https://studysoup.com/tsg/13819/introductory-chemistry-5-edition-chapter-9-problem-25q
Silberberg, M. (2013). Chemistry: The molecular nature of matter and change. McGraw-Hill Education.
Valence Electron - Labster. (n.d.). https://theory.labster.com/valence-electron/
Wikipedia contributors. (2011, September 30). File:Lewis dot Li.svg - Wikipedia. https://en.wikipedia.org/wiki/File:Lewis_dot_Li.svg
Wikipedia contributors. (2024, May 21). Gastropod shell. https://en.wikipedia.org/wiki/Gastropod_shell#/media/File:Arianta_arbustorum_-_Braunau-1968.jpg

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**1. Short Review** Provide the students with electron configuration cards (from 1s to 5f), they will arrange cards into electron configuration charts. Example card: **1s** Then after, the students will use the electron configuration chart along with their periodic tables, identifying the highest energy level found in the following elements: a. Beryllium – b. Silicon – c. Neon –	Dear teacher, the short review could be done as a class board work or by group. Materials for the cards: 1. old folders 2. colored paper 3. printed electron configurations 4. plastic cover 5. tape * The cards are to be covered with plastic for sustainable use. Dimensions are based on your discretion. You may use them for gamified lessons.

	2. Feedback (Optional) This optional sub-component involves giving qualitative feedback to performance or products done through homework or classroom activity from the previous day/week or lesson. *Needs to refer to the previous exemplar	**Expected Responses:** A. Beryllium – 2s B. Silicon – 3s 3p C. Neon – 2s 2p
B. Establishing Lesson Purpose	**1. Lesson Purpose** Using the previous electron configuration chart, let the students identify the number of valence electrons of the identified highest energy level of the following elements: a. Beryllium – $2s^2$ = b. Silicon – $3s^2\ 3p^4$ = c. Neon – $2s^2\ 2p^6$ = *Ask the questions:* a. Why is it important to know the number of valence electrons? b. How can we easily visualize the valence electrons present in an atom? **2. Unlocking Content Vocabulary** **Let's Play Wordle!** Use https://mywordle.strivemath.com/ to modify a wordle game. It will look like this:  Mechanics: Green letters mean that the letters are placed correctly in the word. Gray letters mean that the letters are not part of the word. **Yellow letters** mean that the letters are part of the word but are not placed correctly.	Ask the student what the meaning of the word "valence" is, "valence configuration", "valence electron" repeat the question, such as a. What is the valence configuration for Be? a. Beryllium – $2s^2$ b. What are the valence electrons of Be? Direct the attention of the students to the highlighted superscript Beryllium – $2s^{\mathbf{2}}$ Expected Responses: c. Beryllium – $2s^2$ = 2 valence electrons (ve-) d. Silicon – $3s^2\ 3p^4$ = 6 ve- e. Neon – $2s^2\ 2p^6$ = 8 ve-

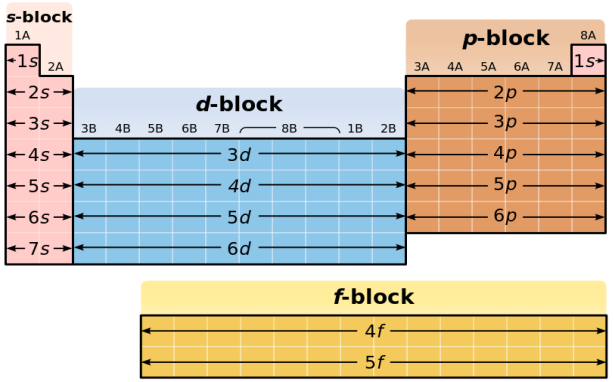
	Students could recite when called to give a term or give the generated link to the students and look for the first student who will get the correct answer. Once the first term: "shell" is unleashed the term could be further discussed and defined. What is a **shell**? When referring to animals, the **shell** is the hard outer covering of eggs for birds and reptiles. Shell is also the covering of some marine animals like snails and clams. What can you observe with the snail's shell?  A shell is formed by building up layers of proteins and minerals. As such, the same term is used in identifying the electrons of an atom using Bohr's model, as the orbits seem to be layered like the snail's shell.  **Shell -** is where the electrons revolve around the nucleus in a specific circular path.	If there is a problem with the available gadgets, the game could be done by pairs/groups. You may also change wordle into 4pics-one-word. Snail's Shell Image Source: educalingo.com Bohr's Model of Atom Image Source: commons.wikimedia.org

What is a **block**?
Ask students if they still remember their childhood toys, what is the most played toy to build things? *They are called **blocks**.*

To what game can you associate blocks?

They could be the online game roblox and lego, right? But before these online games, it started with **blocks**. Blocks are solid pieces mostly rectangular in shape and either made of plastic or wood used to build. They are toys to enhance the manipulative skills of toddlers. These blocks were the inspiration of a toy company to design bricks of legos.

In chemistry, **block** pertains to the set of elements in the periodic table that were grouped according to their orbitals. Orbitals were taught during the discussion of energy levels. Like the toy blocks, these blocks seem like chunks of boxes or rectangles that when they fit together will form the periodic table.



**The same game will be used for the term block.*

Image Source: newtondesk.com

Present the Periodic Table with blocks.

C. Developing and Deepening Understanding

DAY 2
SUB-TOPIC 1: Electron Dot Diagrams

1. Explicitation

Use this chart and present it to the class. Tell the class to complete the table below:

Element	Electron Configuration	Valence Shell	Number of Valence Electron
lithium	$1s^2\ 2s^1$	$2s^1$	1
oxygen	$1s^2\ 2s^2\ 2p^4$	$2s^2\ 2p^4$	6
iron	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$	$4s^2$	2

Ask the question: How valence electrons of an atom were determined?

The visual aids could be a presentation slide or cartolina.

Take Note: <u>Valence shell</u> - This is the outermost shell around the nucleus as presented using Bohr's model of atom. It is where the outermost electrons are located. Outermost electrons are called **valence electrons**.

It should be clear that valence electrons are found in the outermost shell. This is determined using electron

2. Worked Example

It is very tedious to draw Bohr's model of every atom as the number of electrons increases. To easily identify the electrons involved in chemical reactions, the valence electrons of an atom are written in the form of dots. This is called **an electron dot diagram.**

How to draw the Electron Dot Diagram?

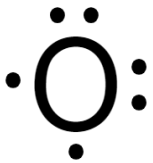
Think-Pair-Share. The students will do the steps with a partner. For example, lithium as answered previously has an outermost shell of $2s^1$ which is also its highest energy level. This means that it has one (1) valence electron.

a. Draw the symbol of lithium. This symbolizes the nucleus or center of the atom.
b. Then, draw a dot on the left side of the "Li" symbol.
c. Make sure that the dot is distinguishable.

The answer will look like this. 

Another example is Oxygen. Its highest energy level is $2s^2\ 2p^4$. Therefore, its valence electrons are six (6).

a. Draw the symbol of Oxygen. This symbolizes the nucleus or center of the atom.
b. Then, draw your first dot on the left side of the "O" symbol.
c. Draw one dot each, clockwise. Until you complete six dots around the "O" symbol. This is to consider that electrons repel each other. They should be distributed evenly before pairing.
d. Make sure that the dot is distinguishable.
e. It will have two dots without a pair, and two paired dots as shown.



What if the given element is a transition element like iron?

a. Transition metals are complicated. They have varied number of valence electrons due to increase of energy levels and movement of electrons.

configuration and following the Aufbau Principle.

Expected Response:

Element	Electron Configuration	Valence Shell	Number of Valence Electron
lithium	$1s^2\ 2s^1$	$2s^1$	1
oxygen	$1s^2\ 2s^2\ 2p^4$	$2s^2\ 2p^4$	6
iron	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$	$4s^2$	2

For the worked example, instead of lecturing the written guide, teachers may provide a supplementary worksheet and do it in pairs. Then, the class will process the answers. Another option is to show the steps, then let the class show their answers first before proceeding with the next example.

Dear teacher, kindly clarify that there is no specific place of dots specially that electrons are moving around the atom. But the placement (starting on the left side of the symbol and doing counterclockwise movement) is for the students to avoid confusion when doing the diagram and to make sure that they were written legibly.

Considering that the iron is in a ground state, the electron configuration will show that the outermost shell of iron is $4s^2$. Therefore, there will be two (2 valence electrons).

The answer will look like this: 

3. Lesson Activity

Activity 1.

Refer to the table below as the expected responses.

Element Name (Symbol)	Group Number	Period Number	Valence configuration	Valence electron	Dot symbol
Lithium (___)	1	2	$2s^1$	1	Li•
_____ (Ne)	18	2	$2s^2\ 2p^6$	8	:Ne:
_____ Mg	2	3	$3s^2$	2	·Mg
Selenium (___)	16	4	$4s^24p^4$	6	: Se :
_____ (Au)	11	6	$5s^13d^{10}$	1	Au .
Molybdenum (___)	6	5	$5s^{14}d^5$	6	: Mo : . .

DAY 3

SUB-TOPIC 2: Blocks in the Periodic Table

1. Explicitation

Let us further know the properties and uses of the elements in the blocks found in the Periodic Table. Use the video titled "SPDF Block Element | Chemistry Animation".

Refer to this link: https://www.youtube.com/watch?v=N0eGOxzlFEw

In a group, you may use LAS Activity 2 as a guide in answering the questions below: See Learning Activity Sheet: *Activity #2: Row-Blocks*

See Learning Activity Sheet: *Activity #1: Fill in the Dots*

Use the material. If there are technical difficulties, an unfilled periodic table could be presented to the class.

Then start with the guide's questions:

1. What elements are found in the first two columns of the periodic table?
2. What are the elements' highest energy levels from columns 1 and 2?
3. What do you think are similar properties of these groups?

* The question may be repeated for each block, or let the students discover the remaining blocks by searching in the school library and then proceed to report the summary table.

Ask these questions:

1. What are the elements in a block found in the Periodic Table?
2. How were elements grouped into blocks?
3. What are the groups or families found in the same block?

Each group will make a summary table (referring to the video) about the groups found in their assigned block (s-p-d-f). The summary must reflect the following information:

- Block
- Group
- Similar properties within the block

Expected/Similar responses:

Block	Group	Properties
s	Alkali Metals	• Reactive with water and oxygen • Loses electrons during chemical reactions • Valence electrons are in s orbital
	Alkaline Earth Metals and Helium	
p	Boron Family	• All nonmetals are members of this block except Hydrogen and Helium • Helium is written with Noble gases because its orbital is already filled to its maximum • Valence electrons are in p orbital • Elements are found in nature in the form of compounds except Bismuth • Harder and Denser than the s-block elements • Consists of the most brittle solids of metalloids.
	Carbon Family	
	Nitrogen Family	
	Oxygen Family	
	Halogens	
	Noble Gases	
d	Transition Metals	• Consists of elements that are transitional between the s and p-block elements • With good electrical conductivity, higher melting and boiling points • Less reactive • Found in nature as free elements

Dear Teacher, help students to at least grasp the overview about transition elements. Though they are expected to be discussed in the previous exemplar, reiterate its unique characteristics. The transition of electrons from 4s to 3d or from 5s to 4d orbitals occurs to attain stability. Though 4 is higher than 3, (or 5 is higher in value than 4) d orbital has greater energy than s orbital. This causes the loss of electrons in the s-orbital during reactions or jumping of electrons from s to d-orbital.

f	Lathanide series Actinide series	• Very reactive with halogens

Family vs. Series

Family is a term interchangeably used with group. Family in society pertains to groups of people united by the ties of marriage, blood, or adoption, constituting a single household and interacting with each other in their respective social positions. As this definition suggests, **Family** in chemistry pertains to elements grouped according to their similarities in properties that are greatly affected by their similar valence electrons.

Series in the English dictionary pertains to several similar or related events or things, one following another. It is usually what people call the television dramas watched every day or mangas read weekly. Therefore, in chemistry, series bears a similar definition to family. However, series is only used with the lathanide and actinide series as they are arranged horizontally (one element to another).

2. Worked Example

Using the periodic table, identify which block contains the following elements:

- metalloids –
- inner transition elements –
- helium –

Using the periodic table, identify the ending orbital of the following elements:

- Indium –
- Tin –
- Antimony –
- Tellurium –
- Iron –
- Xenon –

Ask the students: Do you observe a trend in your answers? What does it mean?

3. Lesson Activity

Activity 3.

See Learning Activity Sheet: *Activity #2: Row-Blocks*

The trivia could be introduced in this form, or start with a question:

- To what type of work or business can you associate the use of lead, copper or zinc?

When the term "mining" is introduced, you may start eliciting more info about how people are exposed to the identified elements and the bioaccumulation of the metals.

Expected responses for Worked example:

- metalloids – p-block
- inner transition elements – f-block
- helium – s-block

Using the periodic table, identify the ending orbital of the following elements:

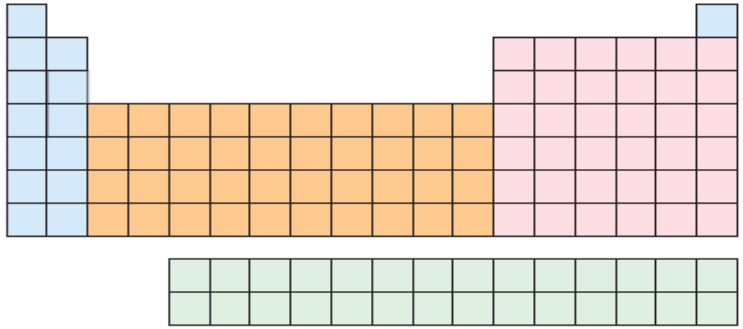
- Indium – $5p^1$
- Tin – $5p^2$
- Antimony – $5p^3$
- Tellurium – $5p^4$

DAY 4
SUB-TOPIC 3: Groups and Similar Properties

1. Explicitation

Previously, the elements were categorized based on their blocks. Similar properties were also found in each group within the same block. The class will continue to understand how elements are arranged in the periodic table. To review them, use an unfilled periodic table and show it to the class.

Example of an unfilled periodic table:



Ask these questions:

1. Identify where s-block, p-block, d-block, and f-block.
2. Identify the groups/families in each block.

2. Worked Example

Continue using the labeled periodic table wherein the group names were seen. Tell the students to assign numbers to each group/column (1 to 18). Let the students label the unfilled periodic table as they identify the blocks, groups, and column numbers. The teacher may demonstrate first.

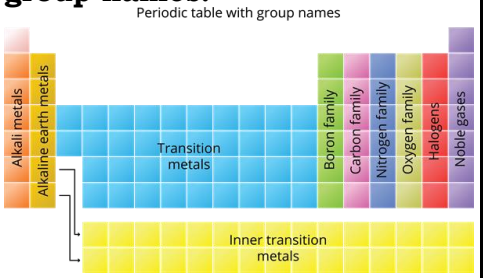
- Based on the arrangement of the representative elements, what trend can you see in the number of valence electrons?

The class will realize the trend below:

- Iron – $5d^5$
- Xenon – $5p^6$

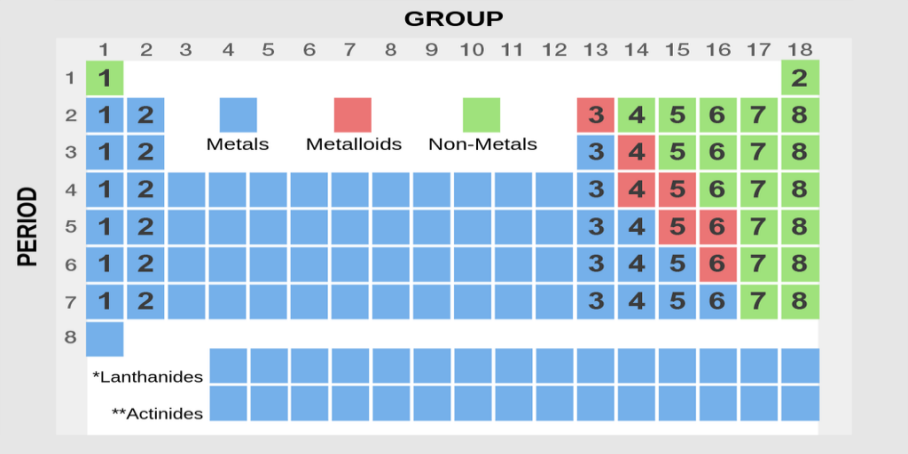
Lesson activity can be used as a take home activity if time is not available.

Expected answers for the group names:



If a slide presentation is not available, prepare the unfilled periodic table using tarpapel or cartolina. Prepare the printed answers and tape for the students to attach their answers as board work.

Another option is to turn it into group work, then the class will process their answers.



The trend is observable by checking the outermost shell of each element. For example, Lithium has an electron configuration of $1s^2\ 2s^1$ wherein the outermost shell is $2s^1$ with valence electrons of 1. Sodium (Na) from the same group has an electron configuration of $1s^2\ 2s^2\ 2p^6\ 3s^1$, wherein the outermost shell is $3s^1$, also with 1 valence electron. This trend of 1 valence electron is observable in the Alkali Metals (group 1).

The trend of the numbers of each group for representative elements is equivalent to the number of valence electrons, considering that the count will be 1 to 8. This explains why some periodic tables are numbered A1 to A8 while others are numbered 1 to 18. Removing "1" in groups 13 to 18 shows the trend of valence electrons in each group. For example, group 15 has 5 valence electrons.

Valence electrons of transition elements vary due to their oxidation number. Oxidation numbers will be discussed in succeeding science lessons. At ground state, most of them bear 2 valence electrons.

3. Lesson Activity
Activity 4.

See Learning Activity Sheet:
Activity #4: Trendy Groups

D. Making Generalizations

1. Learners' Takeaways
Prompt Question: How were elements arranged in the periodic table and how were valence electrons related to these arrangements?

	2. Reflection on Learning **Guide Questions:** a. What have I learned? b. What skill or topic did I struggle to learn? c. What do I need to do next to improve this skill or master the topic?	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** Let the students choose one element that captures their interest. Their answers will be written in their notebooks. Students will refer to their periodic table to provide the following information: Write about the element in a paragraph form using the information written on the table above. **2. Homework (Optional)**	Homework could be the recommended activity if time constraints affect the class session. It could also be a parallel activity to the recommended activities.

Information	Answers
Element Name	
Element Symbol	
Number of Valence Electron	
Electron Dot Diagram	
Group Name and Number	
Block	
Similar Properties it bears with the group	
Elements within the same period and same block (in proper order)	

<table>
<tr><td rowspan="5">B. Teacher's Remarks</td><td>Note observations on any of the following areas:</td><td>Effective Practices</td><td>Problems Encountered</td><td rowspan="5">The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement, and other related stuff.

Teachers may also suggest ways to improve the different activities explored/lesson exemplar.</td></tr>
<tr><td>strategies explored</td><td></td><td></td></tr>
<tr><td>materials used</td><td></td><td></td></tr>
<tr><td>learner engagement/ interaction</td><td></td><td></td></tr>
<tr><td>others</td><td></td><td></td></tr>
<tr><td>C. Teacher's Reflection</td><td colspan="2">Reflection guide or prompt can be on:
• <u>principles behind the teaching</u>
What principles and beliefs informed my lesson?
Why did I teach the lesson the way I did?

• <u>students</u>
What roles did my students play in my lesson?
What did my students learn? How did they learn?

• <u>ways forward</u>
What could I have done differently?
What can I explore in the next lesson?</td><td colspan="2">Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.</td></tr>
</table>